ATTACHMENT A

PROPOSAL FOR COURSE CHANGE

To: Graduate Council
From: Department of Emergency Administration and Management

Date submitted: December 6, 2006

Request for: Course change ______ Course deletion ______ Course addition ______ x ______
(Excluding course credit hour changes)

Submitted by: Robert M. Schwartz

Approved by: Department Head: Robert M. Schwartz
Dean of School:

Reviewed by: Registrar: Tammy Ayers
Vice President:

If this is a deletion or other minor change, describe and give rationale.

If this is an addition of a new course, fill in the following and attach a syllabus (syllabus should include course objectives, and outline of the course with sufficient details to illuminate course content, and a bibliography. The Curriculum Committee/Graduate Council does not need evaluation and testing procedural information nor does it need excessively long bibliographies).

I. Catalog description: (AS IT WILL APPEAR IN THE CATALOG).

**EMHS 6073** Introduction to Terrorism
Prerequisites or corequisites: EMHS 6063 or EAM 1003 and 1013 or consent of instructor. This course is an overview of terrorism in which students will explore various aspects of terrorism in a Post 9/11 world leading to a basic understanding of a global phenomenon. Subject matter will include the history of terrorism, its strategies, and why those strategies are effective. The student will examine the psychology of fundamentalist religious movements and extreme political organizations. While studying the effects of terrorism, the student will examine governmental concerns, preparedness and response operations and the politics of dealing with terrorism.

Number: EMHS 6073

Title for Catalog: Introduction to Terrorism

*Title for Course Inventory (24 characters): Intro. To Terrorism

Description:

This course is an overview of terrorism with an emphasis on state and local response to terrorist incidents. In a Post 9/11 world, it is critical to understand the basics of terrorism, its strategies
and why those strategies are effective. Students will explore governmental concerns, response operations, and the politics of dealing with terrorism.

Effective date or term: Spring 2007

*Course fees: Regular tuition

II. Justification and feasibility of course:

A. What is the need for this course? Who will take it?

Terrorism is considered one of the greatest threats facing the United States today. As a member of the emergency management community, it is necessary to understand the history and techniques of terrorism as well as the social and psychological motivations of those who engage in terrorist acts. This course will also consider some of the effects of terrorism on individuals and on society in general.

This class has been offered as a special topics course (EMHS 5993) with excellent enrollment.

B. How does it relate to other work being offered by your department? Is there an overlap with other courses in the department?

This class will give students one of the core competencies in the EMHS program. There are no overlaps with other classes offered by the department.

C. Is this course part of any general plan of development within your department? Explain.

Emergency Management is a dynamic field and the managers are becoming more professional. This course will increase the knowledge base of the students which will make them more prepared in their careers. The topic is one of the major foci of the Department of Homeland Security.

D. How often will the course be offered?

It is anticipated that this course will be offered every other year.

E. How will the course be staffed?

Richard Ihde, Assistant Professor, will teach the course since he has been teaching it as a special topics selection.

F. When applicable, state with which departments you have specifically coordinated this change? (If unable to identify coordinating departments that change affects, Academic Affairs can offer assistance in identifying course use.)

| List Department Head/ Program Director Consulted: | Indicate Support for Proposal (yes/no) | Date: |
If no, please attach explanation from responding Department Head indicating why they do not support the proposal.

*Note: Each new course proposal must include a short explanation describing how the new course integrates with the assessment process of the department in which the course will be taught.

This course will address several of the core competencies required of EMHS students. One of the main goals of this department is to prepare students with a broad background in emergency management. The knowledge received in this course will give them a foundation for their careers. Assessment of EMHS courses partially involves applications of knowledge, skills, and abilities.

*Updated 8/1/04
**Updated 9/1/05
Course Guide
Emergency Administration and Management

COURSE NUMBER: EMHS 6073 - TC1
COURSE TITLE: Introduction to Terrorism
INSTRUCTOR: Richard A. Ihde, M.Ed.
Russellville, AR 72801
479 968 5803 Home
479 498 6016 Office
rick.ihde@atu.edu

My office hours for consultation will be as follows: Mon – Fri 9:00 to 11:00 and from 1:00 to 3:00 (CST)

COURSE DESCRIPTION:

This course is an overview of terrorism with an emphasis on state and local response to terrorist incidents. In a Post 9/11 world it is critical to understand the basics of terrorism, its strategies and why those strategies are effective. Students will explore governmental concerns, response operations and the politics of dealing with terrorism.

TEXT REQUIRED FOR COURSE


SUPPLEMENTAL READINGS

Supplemental readings will be assigned on the web or from furnished documents made available as needed under course documents on Blackboard.

JUSTIFICATION

Terrorism is considered one of the greatest threats facing the United States today. As a member of the emergency management community, it is necessary to understand the history and techniques of terrorism as well as the social and psychological motivations of those who engage in terrorist acts. This course will also consider some of the effects of terrorism on individuals and on society in general.

COURSE OBJECTIVES

By the end of this course:

- The student will be able to adequately define terrorism in an emergency management context.
- The student will understand the sociological and psychological aspects of terrorism.
- The student will have an understanding of the systemic effects of terrorism.
- The student will understand the effects of terrorism in a community context.
- The student will be able to analyze and understand techniques and strategies of terrorists.
- The student will understand the history and origins of terrorism.
COURSE ASSESSMENT

<table>
<thead>
<tr>
<th></th>
<th>Points</th>
<th>Accumulated Points</th>
<th>Percent</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments 1 thru 9 (50 pts)</td>
<td>450</td>
<td>495 - 550</td>
<td>90 - 100</td>
<td>A</td>
</tr>
<tr>
<td>Final Test</td>
<td>100</td>
<td>440 - 494</td>
<td>80 - 89</td>
<td>B</td>
</tr>
<tr>
<td>Total</td>
<td>550</td>
<td>330 - 384</td>
<td>60 - 69</td>
<td>D</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 - 329</td>
<td>0 - 59</td>
<td>F</td>
</tr>
</tbody>
</table>

COURSE POLICIES

Assignment Completion

Students must complete their assignment within the timeframe specified by the instructor or as listed in the course schedule. Any new assignment will be posted on Blackboard under Assignments on the day the assignment is given.

Late Assignments

Unless arrangements have been made with the instructor, assignments must be received by the due date and time or a zero for that assignment will be entered into the grade book.

Excessive Unexcused Absences/Missed Assignments

Campus policy outlines the dates for dropping a course with a "W". If you have a failing score and do not drop before the stated deadline, you will receive an "F" on your transcript for the course; therefore, it is in your best interest to monitor your status in the course and take advantage of the opportunity to withdraw with a "W" rather than remaining in the course and receiving an "F". Tech now has a very lenient withdrawal policy which eliminates the deadlines for receiving a "WP" (withdrawn with passing) or "WF" (withdrawn with failing) and has extended the period for withdrawing with just a "W" until almost the end of the semester.

You are responsible for explaining to the instructor the reason for absences due to sickness, accident or death in the family. For absences which make it difficult for you to contact the instructor, such as an emergency, you should contact the Student Services Office, Doc Bryan Student Services Center, Room 233, (479-968-0239) to have the instructor notified.

Academic Misconduct

University policy will be followed. At a minimum, the student (and any student caught assisting in the misconduct) will be given an automatic "F" for the test/assignment in question and possibly an "F" for the course. Subsequent cases of plagiarism will result in a minimum of one letter grade course reduction for each incident. In addition, any student who aids another student in plagiarism (e.g., provides a completed homework assignment to another student for submission) will be treated as also being involved in plagiarism and appropriate penalties will apply. Egregious cases of plagiarism (i.e., large sections copied from another source) will result in an automatic "F" for the course.
COURSE CONTENT

Assignments

Each Unit assignment will consist of a reading assignment(s), a narrative summary of the reading assignment and an analysis and summary discussing the most important fact or concept, in your opinion, presented in the reading and a response to at least one other students posting. The unit assignment description with text reading assignment and listing of any outside readings will be posted on Blackboard under the Assignments tab. The student will be required to complete the readings, post an assignment summary and a fact/concept summary on Blackboard in the Discussion Board area and respond to another students posting. For a more detailed explanation on using the Discussion Board to post assignments view the following document: Discussion Board Help. This is posted under Course Documents on Blackboard.

Unit assignment completion will consist of the following steps:

- Complete the reading assignment(s) for the unit
- Complete a summary of the reading assignment(s). (min. 350 words)
- Complete a summary of the most important fact or concept from the reading(s). (min. 350 words)
- Respond to at least one other student's posting. (min. 200 words)
- Include a word count at the end of each summary and your response.

The student response to another student's posting will consist of appropriate comments, thoughts or related ideas branching from that posting.

The sample format for the unit posting is shown in Attachment A. The sample can be used as a template and then copied and pasted into the Blackboard Discussion Board area. Steps to make an assignment posting are:

- Click on Discussion Board in the Control Panel
- Click on the unit number. For example: Unit #1
- Click on Add New Thread
- Type the unit number in the Subject box. (Example: Unit #1)
- Type or copy and paste your assignment into the Message box

The grading rubric for unit assignments is listed below.

<table>
<thead>
<tr>
<th>Unit Assignment Grading Rubric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary Content</td>
</tr>
<tr>
<td>Summary Fact/Concept</td>
</tr>
<tr>
<td>Response to Student</td>
</tr>
</tbody>
</table>

Final Test

The final test will be taken on Blackboard and be listed under the Final Test tab in the Course Content section of the Control Panel

Help with Blackboard

For help using Blackboard go to http://etech.atu.edu/ and click on "Help Desk" then "FAQs - Students" or go to http://elearn.atu.edu/ for further information call 479-964-0546 or toll free at 866-400-8022.

EMHS 6073 - Introduction to Terrorism
PROPOSAL FOR COURSE CHANGE
Arkansas Tech University

Request for:  Course addition:  
Course deletion:  

Change course number:  
Change course title:  

Faculty Senate: Approved date:  
Graduate Council: Approved date:  Dec. 14, 2006 

Disapproved date:  
Disapproved date:  

SECTION I: Course Addition
Course ID: (Prefix/number)  TESL 6891-4 

√ Correct Effective Term 
√ Correct Course Title 
√ Correct Course Level,  √ Correct Course Career 
√ Correct hours (CRED MIN) 
√ Correct Department 
√ Correct CIP Code 
√ Correct Approval Date 

√ NO  YES  Replacing Another Course? (PREV CRS/END DATES) completed?  
(Not necessary if same course number, name change only) 

√ NO  YES  Cross-listed? 

√ NO  YES  Co-requisite? 

√ Normal grading?  P/F?  Other? 

This course may be repeated for degree credit  times for a maximum of  hours. 

Fees attached to class?  210  Amount  Type of fee  

SECTION II: Course Deletion
Course ID (Prefix/Number):  
Correct End date:  

Fee attached?  Course being replaced?  CURR CRS ID completed?  Checked future terms?  
(Does not apply if title change only) 

Screen 125: Add date  2/23/07  Delete Date  By  

If fee, add to list?  By  

Fee approved by Fac/Senate or Graduate Council. Board of Trustees’ approval required before added to rate table.
ATTACHMENT A

PROPOSAL FOR COURSE CHANGE

To: Graduate Council
From: Department of Emergency Administration and Management
Date submitted: December 6, 2006

Request for: Course change x Course deletion Course addition
(Excluding course credit hour changes)

Submitted by: Robert M. Schwartz
Approved by: Department Head: Dean of School:
Reviewed by: Registrar: Vice President:

If this is a deletion or other minor change, describe and give rationale.

This is a change of the catalog description and prerequisites.

If this is an addition of a new course, fill in the following and attach a syllabus (syllabus should include course objectives, and outline of the course with sufficient details to illuminate course content, and a bibliography. The Curriculum Committee/Graduate Council does not need evaluation and testing procedural information nor does it need excessively long bibliographies).

I. Catalog description: (AS IT WILL APPEAR IN THE CATALOG).

EMHS 5003 Principles and Practice of Disaster Relief and Recovery
Prerequisites or corequisites: EAM 1003 and 1013 or EMHS 6063 or consent of instructor.
Students who have taken EAM 4003 can not take EMHS 5003 for credit. Recovery issues are studied in regard to relationships with ethical, medical, economic and environmental considerations. Initial, short-term, and long-term recovery efforts are examined along with group exercises utilizing best practices.

EMHS 5043 Disaster and Emergency Management Ethics
Prerequisites or corequisites: EAM 1003 and 1013 or EMHS 6063 or consent of instructor.
Students who have taken EAM 4043 can not take EMHS 5043 for credit. Involves a study of a variety of types of ethical theory (teleological, deontological, distributive theories of justice, natural law), review of specific ethical dilemmas related to disasters, professional ethics, overcoming biases, avoiding discrimination, and developing sensitivity. Detailed ethical case studies will be conducted.
EMHS 5053 Community Management of Hazardous Materials
Prerequisites or corequisites: EAM 1003 and 1013 or EMHS 6063 or consent of instructor. Students who have taken EAM 4053 cannot take EMHS 5053 for credit. Addresses chemical properties of hazardous materials and wastes; legal requirements for their handling, storage, transportation, and disposal; and methods for protecting employees, facilities, and the community.

EMHS 5991-3 Special Problems and Topics
Prerequisites or corequisites: EAM 1003 and 1013 or EMHS 6063 or consent of instructor. Students who have taken EAM 4993 must have approval from the Department Head regarding the topic for credit in EMHS 5993. The topics will vary to reflect the dynamic changes in the emergency management discipline.

EMHS 6003 Design and Management of Preparedness and Mitigation Systems
Prerequisites or corequisites: EAM 1003 and 1013 or EMHS 6063 or consent of instructor. Reviews the needs and concepts for well structured design and management processes for preparedness and mitigation systems in both the public and private sectors utilizing best methods for implementation.

EMHS 6013 Technology for Comprehensive Emergency Management
Prerequisites or corequisites: EAM 1003 and 1013 or EMHS 6063 or consent of instructor. Covers the technologies that are applied during each of the phases of emergency management. This can include information management, message handling, Geographic Information Systems (GIS), Global Positioning Systems (GPS), material release modeling, situational analysis, and hazard analysis tools.

EMHS 6023 Risk and Vulnerability Assessment for Business and Industry
Prerequisites or corequisites: EAM 1003 and 1013 or EMHS 6063 or consent of instructor. Covers the hazards and threats that businesses and industry face regarding security, safety, and business continuity. The scope of threats and businesses studied range from local to international. Risk analysis, vulnerability, recovery, and business continuity plans will be examined.

EMHS 6033 Foundations of Leadership
Prerequisites or corequisites: EAM 1003 and 1013 or EMHS 6063 or consent of instructor. Examines the past and present models of leadership. Topics include current context for leadership and personal leadership styles. Case studies are utilized in both the public and private sectors in relation to emergency management.

EMHS 6043 Contemporary Issues in Emergency Management
Prerequisites or corequisites: EAM 1003 and 1013 or EMHS 6063 or consent of instructor. Emphasizes and analyzes the practical aspects of problems facing the emergency manager. Topics could include compliance issues with regard to Homeland Security, the National Incident Management System, the National Response Plan, and other initiatives.

EMHS 6053 Legal Issues in Emergency Management
Prerequisites or corequisites: EAM 1003 and 1013 or EMHS 6063 or consent of instructor. Involves research, analysis, and discussion of law that affect emergency management. Emphasis will be placed on the legal obligations of the emergency management professional utilizing case studies and contemporary examples.

EMHS 6103 Research Design and Methods
EMHS 6103 Research Design and Methods
Prerequisites or corequisites: EAM 1003 and 1013 or EMHS 6063 or consent of instructor. Demonstrates the comprehension of research, design, and methods. Qualitative and quantitative methods are discussed along with the utilization of the scientific method. Professionalism and models for research are also covered.

EMHS 6303 Thesis Research
Prerequisites: Completion of the 21-hour professional component including EMHS 6103 or consent of instructor. Creates a research proposal resulting in the design of the thesis. The topic and design is developed with the approval of a supervising professor and committee.

EMHS 6403 Action Research Practicum I
Prerequisites: Completion of the 21-hour professional component including EMHS 6103 or consent of instructor. Creates a research proposal resulting in the design of the action research project. The topic and design is developed with the approval of a supervising professor and committee.

EMHS 6413 Action Research Practicum II
Prerequisite: EMHS 6403. Students will be required to develop and defend the action research project as approved by the supervising professor and committee. The defense will be presented in a seminar to faculty, staff, and other graduate students.

Number:

Title for Catalog:

*Title for Course Inventory (24 characters):

Description:

Effective date or term: Spring 2007

*Course fees: Regular tuition

II. Justification and feasibility of course:

A. What is the need for this course? Who will take it?

B. How does it relate to other work being offered by your department? Is there an overlap with other courses in the department?

C. Is this course part of any general plan of development within your department? Explain.
Emergency Management is a dynamic field and the managers are becoming more professional. It is necessary for graduates to have a knowledge base that consists of core competencies. This class will make the graduates more prepared for their careers.

D. How often will the course be offered?

E. How will the course be staffed?

F. When applicable, state with which departments you have specifically coordinated this change? (If unable to identify coordinating departments that change affects, Academic Affairs can offer assistance in identifying course use.)
Not Applicable

<table>
<thead>
<tr>
<th>List Department Head/ Program Director Consulted:</th>
<th>Indicate Support for Proposal (yes/no)</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Add to list as needed)</td>
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<tr>
<td>Not Applicable</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1.

2.

3.

4.

5.

If no, please attach explanation from responding Department Head indicating why they do not support the proposal.

*Note: Each new course proposal must include a short explanation describing how the new course integrates with the assessment process of the department in which the course will be taught.

This course will address several of the core competencies required of EMHS students. One of the main goals of this department is to prepare students with a broad background in emergency management. The knowledge received in this course will give them a foundation for their careers. Assessment of EMHS courses partially involves applications of knowledge, skills, and abilities.

*Updated 8/1/04
**Updated 9/1/05
ATTACHMENT A

PROPOSAL FOR COURSE CHANGE

To: Graduate Council
From: Department of Emergency Administration and Management

Date submitted: December 6, 2006

Request for: Course change ______ Course deletion ______ Course addition x ______
(Excluding course credit hour changes)

Submitted by: Robert M. Schwartz

Approved by: Department Head: Robert M. Schwartz
Dean of School: Mary Ann Carroll

Reviewed by: Registrar: Tammy Fludd
Vice President: ______

If this is a deletion or other minor change, describe and give rationale.

If this is an addition of a new course, fill in the following and attach a syllabus (syllabus should include course objectives, and outline of the course with sufficient details to illuminate course content, and a bibliography. The Curriculum Committee/Graduate Council does not need evaluation and testing procedural information nor does it need excessively long bibliographies).

I. Catalog description: (AS IT WILL APPEAR IN THE CATALOG).

EMHS 6063 Principles of Hazards and Emergency Management
Provides an overview of hazards theory, emergency management fundamentals, and the science of various hazards. Both natural and technological hazards are studied with the perspective of emergency management. Some of the topics include earthquakes, tsunami, volcanoes, floods, wildfires, terrorism, tornadoes, winter storms, and hurricanes.

Number: EMHS 6063

Title for Catalog: Principles of Hazards and Emergency Management

*Title for Course Inventory (24 characters): Princ. Hazards and Emer. Mngt.

Description:

This course covers the basic theories of various hazards and emergency management. Emergency managers need to understand the basic scientific principles in order to communicate with experts and the public. This will aid in decision making along with expanding the student’s knowledge. Both natural and technological hazards are studied with the perspective of emergency management. Some of the topics include earthquakes, tsunami, volcanoes, floods, wildfires, terrorism, tornadoes, winter storms, and hurricanes.
Effective date or term: Spring 2007

*Course fees: Regular tuition

II. Justification and feasibility of course:

A. What is the need for this course? Who will take it?
Several of the students applying to the EMHS program have Bachelor degrees from different disciplines. Presently, the prerequisites for many of the EMHS courses are EAM 1003 and 1013. This class is a graduate level of these two courses. Additionally, some students who have an emergency management background desire to take the class to receive a stronger science background.

This class will be required of students without the science or emergency management background. The class has been offered as a workshop (EMHS 6883-3) twice. After reviewing current graduate applications, it appears that it will be necessary to offer this class on a regular basis.

B. How does it relate to other work being offered by your department? Is there an overlap with other courses in the department?

This class will give students lacking the fundamentals the knowledge to continue in the graduate program. There are no overlaps with other classes offered by the department.

C. Is this course part of any general plan of development within your department? Explain.

Emergency Management is a dynamic field and the managers are becoming more professional. It is necessary for graduates to have a knowledge base that consists of core competencies. This class will make the graduates more prepared for their careers.

D. How often will the course be offered?

It is anticipated that this course will be offered every semester.

E. How will the course be staffed?

Dr. Robert M. Schwartz, Associate Professor, will teach the course since he has been teaching it as a workshop.

F. When applicable, state with which departments you have specifically coordinated this change? (If unable to identify coordinating departments that change affects, Academic Affairs can offer assistance in identifying course use.)

Not applicable

List Department Head/ Program Director Consulted: Indicate Support Date:
(Add to list as needed) for Proposal (yes/no)
If no, please attach explanation from responding Department Head indicating why they do not support the proposal.

*Note: Each new course proposal must include a short explanation describing how the new course integrates with the assessment process of the department in which the course will be taught.

This course will address several of the core competencies required of EMHS students. One of the main goals of this department is to prepare students with a broad background in emergency management. The knowledge received in this course will give them a foundation for their careers. Assessment of EMHS courses partially involves applications of knowledge, skills, and abilities.

*Updated 8/1/04
**Updated 9/1/05
Course Outline
Emergency Administration and Management

Course Number: EMHS 6063-01

Course Title: Principles of Hazards and Emergency Management

Instructor: Dr. Robert M. Schwartz  
Bryan Hall 221  
Office: (479) 968-0316  
Main Office: (479) 356-2092  
robert.schwartz@atu.edu  
Office Hours: M-Th 9:00-11:30; or by appointment

Catalog Description

Provides an overview of hazards theory, emergency management fundamentals, and the science of various hazards. Both natural and technological hazards are studied with the perspective of emergency management. Some of the topics include earthquakes, tsunamis, volcanoes, floods, wildfires, terrorism, tornados, winter storms, and hurricanes.

Required Text


ISBN: 0-495-11210-0

Supplemental Reading

There will be additional assigned readings throughout the course. You will also locate reference materials and utilize data sources.

Rationale of Course

This course will cover the basic theories of various hazards and emergency management. Emergency managers need to understand the basic scientific principles in order to communicate with experts and the public. This will aid in decision making along with expanding the student’s knowledge. Furthermore, the course is designed to promote critical thinking through applications which is a basis for learning rather than memorizing material.
Course Objectives

Students will gain a better understanding of:

- the scientific process of various hazards
- basic fundamentals of Emergency Management
- professionalism in Emergency Management
- data sources and their reliability
- utilization of technology and data in Emergency Management

Course Policies

Assignment Completion

Students must complete their assignment within the time frame specified by the instructor or as listed in the course schedule. All assignments will be announced in class.

Late Assignments

Assignments must be received by the due date and time as given in the assignment instructions. If you have not made arrangements with the instructor, late assignments will be given a zero.

Excessive Unexcused Absences/Missed Assignments

Campus policy outlines the dates for dropping a course with a “W.” If you have a failing score and do not drop before the stated deadline, you will receive an “F” on your transcript for the course; therefore, it is in your best interest to monitor your status in the course and take advantage of the opportunity to withdraw with a “W” rather than remaining in the course and receiving an “F.” Tech has a lenient withdrawal policy which eliminates the deadlines for receiving a “WP” (withdrawn with passing) or “WF” (withdrawn with failing) and has extended the period for withdrawing with just a “W” until almost the end of the semester.

You are responsible for explaining to the instructor the reason for absences due to sickness, accident or death in the family. For absences which make it difficult for you to contact the instructor, such as an emergency, you should contact the Student Services Office, Doc Bryan Student Services Center, Room 233, (479-968-0239) to have the instructor notified.

Academic Misconduct

University policy will be followed. At a minimum, the student (and any student caught assisting in the misconduct) will be given an automatic “F” for the test/assignment in question and possibly an “F” for the course. Subsequent cases of plagiarism will result in a minimum of one letter grade course reduction for each incident. In addition, any student who aids another student in plagiarism (for example, provides a completed homework assignment to another student for
submission) will be treated as also being involved in plagiarism and appropriate penalties will apply. Egregious cases of plagiarism (i.e., large sections copied from another source) will result in an automatic “F” for the course.

Emergency Managers have been entrusted with a large responsibility, and must strive to gain and maintain the trust of those served. It is very important to act and perform in a professional and courteous manner at all times and in all things.

Course Content

Assignments

Students will follow the schedule as discussed in class. Various topics covered during the semester will have appropriate assignments.

Discussions

All students are expected to participate in discussions throughout the semester. There may be readings, a topic, or a current event which will require your comments. During these discussions, different opinions are valued, but do back up your point and do not make personal attacks.

Quizzes and Exams

Since this is a graduate class, there will not be any scheduled quizzes or exams. Assessment is based on papers, discussion, and projects. However, if I feel you are not performing, quizzes and exams will be initiated. Exams are to evaluate how well you comprehend the material and synthesize concepts.

Projects

Projects and papers will be utilized to apply the theories and knowledge to different situations. The purpose of the course is to learn rather than playing the “grade game.” Make-up projects will not be permitted unless there is an arrangement with the instructor. Unexcused absences for projects will receive a zero.

Final Project

The final project involves selecting a hazard of interest and examining a specific aspect of that hazard along with the emergency management fundamentals of preparedness, response, recovery, and mitigation along with the data analysis. The same general hazard may be selected by more than one individual, but different aspects or approaches must be selected. It is first come, first served on topics approved by the instructor. An oral presentation is also mandatory.
Course Assessment

The approximate proportional value of this semester's course work is as follows:

<table>
<thead>
<tr>
<th>Course</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Papers</td>
<td>600</td>
</tr>
<tr>
<td>Final Project</td>
<td>125</td>
</tr>
<tr>
<td>Total</td>
<td>725</td>
</tr>
</tbody>
</table>

Final grade assignments will be made according to the following schedule:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>≥ 90%</td>
<td>653-725</td>
</tr>
<tr>
<td>B</td>
<td>80-89%</td>
<td>580-652</td>
</tr>
<tr>
<td>C</td>
<td>70-79%</td>
<td>508-579</td>
</tr>
<tr>
<td>D</td>
<td>60-69%</td>
<td>435-507</td>
</tr>
<tr>
<td>F</td>
<td>≤ 59%</td>
<td>≤ 434</td>
</tr>
</tbody>
</table>

Tentative Course Outline

Topic I: Introduction to Hazards  
  Theory and Concepts

Topic II: Fundamentals of Emergency Management  
  Preparedness  
  Response  
  Recovery  
  Mitigation

Topic III: Geological, Hydrological, and Anthropogenic Hazards  
  Earthquakes and Tsunami  
  Volcanoes  
  Wildfires  
  Floods  
  Environmental Terrorism

Topic IV: Atmospheric Hazards  
  Fundamentals of Weather and Climate  
  Thunderstorms and Tornadoes  
  Heat and Cold Waves  
  Hurricanes  
  Climate Change

Note: The instructor reserves the right to make changes to this schedule and/or policies. If there are any changes, it will be announced in class and posted on Blackboard under Announcements.
Assistance with Blackboard

For help using Blackboard, go to http://etech.atu.edu and click on “Help Desk” and then “FAQs-Students” or go to http://elearn.atu.edu for further information. You can call 479-964-0546, toll-free 1-866-400-8022 or e-mail annette.stuckey@atu.edu.

Instructor’s Expectations:

Principles of Hazards and Emergency Management is a class that covers aspects of both physical and human variables along with the fundamentals of emergency management. The format will be both lecture and discussion. A course involving discussion requires that you are an active participant to become successful. The more effort you put into the class, the better it is for you and your colleagues. It is expected that you come to class prepared and synthesize the information from the various sources. I expect you in write in a clear and concise manner. This course is designed to challenge you and expand your horizons for personal learning and growth. I hope you will put out the effort to succeed.

I have specific expectations regarding attendance and participation along with completing assignments or projects by due dates. Hopefully this will prepare you for future employment in a professional environment. What happens when you show up late for work? Or skip work by calling off? Most likely you will lose your job. When projects are late, if you miss appointments, or if you don’t do your work in a professional manner, you’ll probably be fired. In the real world, owners or supervisors are not very tolerant in the workplace. The emergency management discipline requires professionalism on all levels. In this course, you are the employees and your check is your grade.

For your commitment, I also will operate in a professional manner. I pledge to do the best job I’m capable of teaching Principles of Hazards and Emergency Management. You should gain something worthwhile for your 3-credit hour investment if you accept the challenge of the class and work hard to learn the concepts.

Even though we only meet once a week, I am available to meet with you at other times. Also, if you can’t contact me during office hours, please make an appointment.

Good luck and have a great semester.
PROPOSAL FOR COURSE CHANGE

To: Graduate Council

From: Department of Emergency Administration and Management

Date submitted: December 6, 2006

Request for: Course change x Course deletion Course addition (Excluding course credit hour changes)

Submitted by: Robert M. Schwartz

Approved by: Department Head:
Dean of School: 

Reviewed by: Registrar:
Vice President:

If this is a deletion or other minor change, describe and give rationale.

If this is an addition of a new course, fill in the following and attach a syllabus (syllabus should include course objectives, and outline of the course with sufficient details to illuminate course content, and a bibliography. The Curriculum Committee/Graduate Council does not need evaluation and testing procedural information nor does it need excessively long bibliographies).

I. Catalog description: (AS IT WILL APPEAR IN THE CATALOG).

EMHS 6311-3 Thesis Seminar
Prerequisite: EMHS 6303. This is a variable credit class that can be repeated for a total of three credits. It is required to complete three hours for graduation. Students will be required to develop and defend a formal thesis as approved by the supervising professor and committee. The thesis will be presented in a seminar to faculty, staff, and other graduate students.

Number: EMHS 6311-3

Title for Catalog: Thesis Seminar

*Title for Course Inventory (24 characters): Thesis Seminar

Description:
This course represents the culmination of the thesis with a defense in a seminar format. Students can take this course in one hour increments in order to spread the thesis work over more than one semester. Progress must be documented in order to receive a grade. Three credits are required for graduation.

Effective date or term: Spring 2007
II. Justification and feasibility of course:

A. What is the need for this course? Who will take it?
There will be cases where students will not complete the thesis in one semester. This proposal will make the class available on a variable credit basis. Students will need to complete three hours to complete the degree if taking the thesis option.

This class will be required of students taking the thesis option.

B. How does it relate to other work being offered by your department? Is there an overlap with other courses in the department?

This class represents the capstone of the graduate program. There are no overlaps with other classes offered by the department.

C. Is this course part of any general plan of development within your department? Explain.

Emergency Management is a dynamic field and the managers are becoming more professional. It is necessary for graduates to have a knowledge base that consists of core competencies. This class will make the graduates more prepared for their careers.

D. How often will the course be offered?

It is anticipated that this course will be offered every semester.

E. How will the course be staffed?

Dr. Robert M. Schwartz, Associate Professor, will teach the course.

F. When applicable, state with which departments you have specifically coordinated this change? (If unable to identify coordinating departments that change affects, Academic Affairs can offer assistance in identifying course use.)

Not Applicable

List Department Head/Program Director Consulted: 
Indicate Support for Proposal (Add to list as needed) (yes/no)

Not Applicable

Date:

1.

2.

3.
4.

5.

If no, please attach explanation from responding Department Head indicating why they do not support the proposal.

*Note: Each new course proposal must include a short explanation describing how the new course integrates with the assessment process of the department in which the course will be taught.

This course will address several of the core competencies required of EMHS students. One of the main goals of this department is to prepare students with a broad background in emergency management. The knowledge received in this course will give them a foundation for their careers. Assessment of EMHS courses partially involves applications of knowledge, skills, and abilities.

*Updated 8/1/04
**Updated 9/1/05
PROPOSAL FOR COURSE CHANGE

To: Graduate Council
From: Department of Social Sciences and Philosophy
Date submitted: 1 October 2006
Request for: Course change
Submitted by: H. Micheal Tarver
Approved by: Department Head: [Signature]
Dean of School: [Signature]
Reviewed by: Registrar: [Signature]
Vice President: [Signature]

THIS IS A COURSE DESCRIPTION CHANGE ONLY.

I. Catalog description: Seminar in Modern European History. An investigation of selected topics in modern European history. ... [continuation of current description]

[The word “early” is being deleted from the first sentence of the current Catalog.]

Number: HIST 6413
Title for Catalog: Seminar in Modern European History.

*Title for Course Inventory (24 characters):
Description:
Effective date or term: Spring 2007

*Course fees: NONE
PROPOSAL FOR COURSE CHANGE

To: Graduate Council
From: Department of Social Sciences and Philosophy
Date submitted: 1 October 2006
Request for: Course change
Submitted by: H. Micheal Tarver
Approved by: Department Head: [Signature]
Dean of School: [Signature]
Reviewed by: Registrar: [Signature]
Vice President: [Signature]

THIS IS A COURSE DESCRIPTION CHANGE ONLY.

I. Catalog description: Seminar in Global Studies. A seminar on current world geographic influences that affect the nations of the world, such as demographics, complex environmental and physical changes, and political and economic relationships. May not be taken for credit after completion of GEOG 4803.

Number: GEOG 5803
Title for Catalog: Seminar in Global Studies
*Title for Course Inventory (24 characters): Seminar in Global Studies

Description: A seminar on current world geographic influences that affect the nations of the world, such as demographics, complex environmental and physical changes, and political and economic relationships.

Effective date or term: Spring 2007

*Course fees: NONE
PROPOSAL FOR COURSE CHANGE

To: Graduate Council
From: Department of Social Sciences and Philosophy
Date submitted: 1 October 2006
Request for: Course change
Submitted by: H. Michele Tarver
Approved by: Department Head: [Signature]
Dean of School: [Signature]
Reviewed by: Registrar: [Signature]
Vice President: [Signature]

THIS IS A COURSE DESCRIPTION CHANGE ONLY.

I. Catalog description: Readings in Modern European History. A readings course in selected topics in modern European history. ... [continuation of current description]

   [The word “early” is being deleted from the first sentence of the current Catalog.]

Number: HIST 6433
Title for Catalog: Readings in Modern European History.

*Title for Course Inventory (24 characters):

Description: [June]
Effective date or term: Spring 2007

*Course fees: NONE
TO: Graduate Council
FROM: Electrical and Mechanical Engineering Departments
Date: January 19, 2006

Type of Curriculum Change Requested: Course Additions

The Departments request permission to add the following graduate courses in support of the proposed Masters of Engineering degree program:

ELEG 5113 – Digital Signal Processing
ELEG 5133 – Advanced Digital Design
ELEG 5153 – Communication Systems II
MCEG 5323 – Power Plant Systems
MCEG 5503 – Nuclear Power Plants I
MCEG 6503 – Reactor Physics
MCEG 6513 – Radiation Measurement
MCEG 6523 – Nuclear Materials
MCEG 6533 – Radiation Interactions and Shielding
MCEG 6881-4 – Workshop
MCEG 6891-6 – Independent Study

Submitted by: Mechanical Engineering Department

Approved by:
Department Head: ____________________________
Department Head: ____________________________
Dean of School: ______________________________

Reviewed by: Registrar: ________________________
VPAA: ______________________________________
I. Catalog Descriptions

ELEG 5113 – Digital Signal Processing. Prerequisites: ELEG 3123 and 3133. The study of discrete-time signals and systems, convolution, correlation, z-transform, discrete-time Fourier transform, analysis and design of digital filters. Students write software for real-time implementation of selected signal processing algorithms using DSP microcomputer hardware. May not be taken for credit after completion of ELEG 4113.

ELEG 5133 – Advanced Digital Design. Prerequisites: ELEG 2131, 2133. A project oriented course in which students develop and test custom digital integrated circuits (IC’s). An overview of IC design systems and manufacturing processes is presented. Economics of IC production are discussed. Hardware Description Languages (HDL’s) are studied. Students design and implement custom IC’s using schematic based entry and HDL’s. May not be taken for credit after completion of ELEG 4133.

ELEG 5153 – Communication Systems II. Prerequisites: ELEG 4143. Continuation of ELEG 4143. Design and analysis of analog and digital communication systems, taking into account the effects of noise. Random variables, random processes, analog and digital communication systems in the presence of noise. May not be taken for credit after completion of ELEG 4153.

MCEG 5323 – Power Plant Systems. Prerequisites: MCEG 3313, 4403. A study of the design and operation of steam-electric power plant components and systems. Fossil and renewable energy plants are emphasized. May not be taken for credit after completion of MCEG 4323.

MCEG 5503 – Nuclear Power Plants I. Prerequisites: MCEG 3503, MCEG 4403. A study of the various types of nuclear reactor plants including the methods used for energy conversion. Relative advantages/disadvantages of various plant types investigated. May not be taken for credit after completion of MCEG 4503.

MCEG 6503 – Reactor Physics. Prerequisites: PHYS 3213, MCEG 3503, MATH 5243. A study of the fundamental physical principles in the operation and design of nuclear reactors. Includes neutron-nucleus interactions, neutron energy spectra and energy dependent cross sections, neutron transport and diffusion theory, multi-group approximations, criticality calculations, and reactor analysis and design methods.

MCEG 6513 – Radiation Measurement. Prerequisites: MCEG 3503, MCEG 3512. The study of radiation techniques and equipment used by scientists and engineers. Topics of interest will include techniques and equipment for detecting ionizing radiation below about 20 MeV, Coincidence counting methods, and reactor laboratory experiments (as available). Lecture two hours, lab three hours.

MCEG 6523 – Nuclear Materials. Prerequisites: MCEG 2023 and MCEG 3503. A study of the properties of materials utilized in nuclear reactors, shielding systems and other systems exposed to radiation. Emphasis will be placed on understanding and mitigating the damage of such materials by neutron and gamma radiation.
MCEG 6533 – Radiation Interactions and Shielding. Prerequisites: MCEG 3503, MCEG 3523. Basic principles of radiation interactions, transport and shielding. Radiation sources, nuclear reactions, radiation transport, photon interactions, dosimetry, and shielding design will be covered.

MCEG 6881-3 – Workshop. Prerequisite: permission of instructor. The workshop will require the equivalency of fifteen clock hours of instruction per credit hour.

MCEG 6891-6 – Independent Study. Prerequisite: completion of 18 hours toward program requirements, approval of advisor. Students will complete an engineering project approved by their Advisory Committee. The project must include elements of engineering design and project management with a subject relevant to the student’s program of study. Successful completion of the project will include a professional report and full presentation of the project findings/results.

Titles for Course Inventory:
ELEG 5113 – Digital Signal Process
ELEG 5133 – ASIC Design
ELEG 5153 – Communications Sys II
MCEG 5323 – Power Plant Systems
MCEG 5503 – Nuclear Power Plants I
MCEG 6503 – Reactor Physics
MCEG 6513 – Radiation Measurement
MCEG 6523 – Nuclear Materials
MCEG 6533 – Rad. Interact. & Shield.
MCEG 6881-3 - Workshop
MCEG 6891-6 – Independent Study

Effective date or term: All courses are requested to be added to the course inventory for the Fall, 2007 semester.

Course Fees: Radiation Measurement (MCEG 6513) will carry a $50 fee for lab supplies.
II. Justification and Feasibility of Courses

A. Need for course and potential students

These courses are needed to support the proposed Masters of Engineering degree program. MCEG 6503, 6513, 6523 and 6533 are new courses which would constitute the bulk of a nuclear engineering focus area. Corresponding 4000 level ELEG or MCEG courses exists for the proposed 5000 level courses. Potential students are candidates for the Masters of Engineering degree.

B. Relation to existing courses

The proposed 5000 level courses are graduate counterparts to existing 4000 level courses currently offered. These courses will not be eligible to be taken for credit by students who have previously taken the corresponding 4000 level course. The proposed 6000 level courses are related to existing 3000 and 4000 level elective courses which are used to support the current nuclear technology program. The proposed courses are typical of master’s level courses in nuclear engineering programs.

C. Course relation to departmental development plan

The proposed courses are vital to the departments’ plan to establish a Masters of Engineering degree program. The proposed courses represent the bulk of the courses in a nuclear engineering focus area within the proposed degree program.

D. Course offerings

The proposed 5000 level courses are currently being offered every third or fourth semester as 4000 level electives and this frequency is planned to continue. The departments plan to offer each 6000 level course once every two years. If program enrollment dictates, this frequency could increase to once per year.

E. Course staffing

The proposed 5000 level courses are currently being staffed by the existing electrical and mechanical engineering faculty. The 6000 level courses will be taught by existing faculty and/or new faculty members. One new full-time tenure-track faculty member will be added to the Mechanical Engineering Department in the Fall, 2007 semester.

III. Assessment Integration

The proposed 5000 level courses have existing 4000 level complements. These courses have established learning objectives and are integrated into the departments’ undergraduate program assessment plans. These same course learning objectives will be used for the 5000 level courses and will be implemented into the graduate program assessment plan in a similar fashion. The 6000 level courses have learning objectives and assessment methods for these objectives stated in the attached syllabi. These objectives will be assessed as part of the program assessment plan. The full integration can be seen in the program assessment document prepared and submitted with the request for establishment of the graduate program.
Course Syllabi

Syllabi for each of the proposed graduate courses are attached.
ENGR 5113 Digital Signal Processing

2006-07 Catalog Data: Prerequisites: ENGR 3123 and 3133 or ENGR 3223. The study of discrete-time signals and systems, convolution, correlation, z-transform, discrete-time Fourier transform, analysis and design of digital filters. Students write software for real-time implementation of selected signal processing algorithms using DSP microcomputer hardware. Lecture three hours.


Coordinator: Charles Wu, Assistant Professor, Electrical Engineering

Objectives: For each student to:

1) Understand the basic properties of discrete-time signals and systems. [1]

2) Be able to analyze discrete-time linear time-invariant systems in the time-domain. [1, 3]

3) Effectively use mathematical transforms in the analysis of linear systems. [1, 3]

4) Understand the effect of analog-to-digital and digital-to-analog conversion in both time and frequency-domain. [1]

5) Solve linear difference equations in both the time and transform domains. [1]

6) Realize discrete-time systems using basic operations. [1, 3]

7) Be familiar with efficient implementations of discrete Fourier transform. [1, 3]

8) Use software tools for the design of digital filters. [3]

Topics: 1. Discrete-time systems, properties, difference equations, Fourier series representations, sampling.

* Refers to the number of the educational objective(s) of the program leading to the BSEE degree at Arkansas Tech University that applies to course objective.
2. Z-Transform, inverse, properties, applications.

3. Network realizations, basic forms (direct I/II, cascade, parallel), transposed forms, IIR, FIR, quantization effects.

4. Discrete Fourier transform, series and properties, circular convolution.

5. Fast Fourier transform, decimation in time/frequency algorithms.

6. Design of IIR filters, difference equation, impulse invariance, bilinear transformation.

7. Design of FIR filters, windows, frequency sampling, equiripple approximation.

Computer Usage: Students will use MATLAB to conduct filter design, prototype system analysis and simulation.

Laboratory Project: A final design project is assigned in which a digital filter is designed, simulated, and modified if necessary. The filter is constructed in the laboratory if time permits. Students taking this course for graduate credit will complete an additional project and present the results to the class.

Evaluation Methods: A. Examinations
B. Final design project
C. Oral presentation of design project results

Performance Criteria: Objectives 1 through 7: Students will demonstrate understanding of DSP techniques and their application by completing in-class examinations and design work-sheets. [A]\(^b\)
Objective 8: Each student will present an oral report on the final design project and will submit a formal written report describing the project. These will be graded on criteria supplied to the student in advance.[B,C]

Prepared by: Charles Wu
Jan. 2007

\(^{b}\) Refers to evaluation method(s) to measure student performance.
ELEG 5133: Advanced Digital Design

2006-2007 Catalog Data:  Prerequisites: ELEG 2131, 2133. A Project oriented course in which students develop and test custom digital integrated circuits (IC’s). An overview of IC design systems and manufacturing processes is presented. Economics of IC production are discussed. Hardware Description Languages (HDL’s) are studied. Students design and implement custom IC’s using schematic based entry and HDL’s. Lecture one hour per week, project work two hours per week.


Coordinator: Carl Greco, Ph.D., Associate Professor

Prerequisites by Topic: 1. Knowledge of basic circuits and digital electronics
2. Knowledge of basic combinational and sequential logic design
3. Knowledge of basic HDL-based digital design

Objectives: 1. To impart a basic understanding of modern IC design and fabrication processes and the economics of those processes. [3]³
2. To gain proficiency in the use of computer-aided design systems for IC design and implementation. [3]
3. To develop a comprehensive knowledge of Hardware Description Language sufficient to synthesize complex digital circuits. [3]
4. To acquire practical design experience through team-based design projects in the laboratory. [2,3]

Topics: 1. Types of custom IC’s
2. Economics of IC’s
3. Hardware Description Languages
4. Design entry using CAD
5. Design for simulation
6. Design for synthesis
7. Implementation using FPGA’s and CPLD’s
8. Routing and floorplanning
9. Testbenches for HDL

Laboratory and Computer Projects: Extensive use of computers in design, simulation, synthesis, implementation and testing of IC’s and digital circuits. Class meets in the lab two hours per week and completes three team-based design projects. Students taking this course for graduate credit will complete an additional project and present the results to the class.

Evaluation Methods: A. Homework
B. Exams
C. Project

³ Refers to the number of the educational objective(s) of the program leading to the BSEE degree at Arkansas Tech University that applies to course objective.
Performance Criteria:

Objective 1:
1.1 Students will demonstrate an understanding of the different types of custom IC's. [A,B]
1.2 Students will be able to select the appropriate type of IC for an application based on economics. [A,B]

Objective 2:
2.1 Students will be proficient in the use of CAD for schematic capture, HDL design entry, simulation, synthesis, and implementation of custom IC's. [A,C]

Objective 3:
3.1 Students will understand the usefulness of HDL and what types of activities it can automate. [A,C]
3.2 Students will be proficient in HDL programming. [A,B,C]

Objective 4:
4.1 Students will be able to work effectively in design teams. [C]
4.2 Students will be proficient in development of custom IC's in the laboratory. [C]

Prepared by: Murray R. Clark, Assistant Professor
May, 2002

Revised by: Carl Greco, Ph.D., Associate Professor
August, 2005, August, 2006 and January 2007

\(^d\) Refers to evaluation method(s) to measure student performance.
ELEG 5153 Communications II

2006-07 Catalog Data: Prerequisites: ELEG 4143. Continuation of ELEG 4143. Design and analysis of analog and digital communication systems, taking into account the effects of noise. Random variables, random processes, analog and digital communication systems in the presence of noise. Optimum signal detection, channel capacity, error detecting and correcting codes. Lecture three hours.


Coordinator: Dr. Liu

Objectives: 1. Provide a review of probability and statistics as applied to communication systems. [1]*
2. Introduce random processes and methods for the mathematical description of noise in analog and binary communication systems. [1,3]
3. Introduce methods of binary data transmission. [1]
4. Introduce matched filter detection for binary data transmission in the presence of Gaussian white noise. [1]
5. To provide an introduction to binary signaling in a band limited channel and Nyquist’s pulse shaping criterion. [1]
6. To provide a brief introduction to information theory and source encoding. [1,3]
7. Provide experience in applying computer simulation to design and error rate prediction for communication systems. [1,3]
8. To provide some laboratory experience with the effects of noise. [1,2,3]

9. The concept of a random process: sample functions,

* Refers to the number of the educational objective(s) of the program leading to the BSEE degree at Arkansas Tech University that applies to course objective.
ensembles, power spectral density, the autocorrelation function, the Wiener-Khinchine theorem.
10. Effects of linear systems on random processes.
12. Pre and post detection signal to noise ratios for linear modulation systems.
13. Threshold effects in amplitude modulation systems.
14. Pre and post detection signal to noise ratios for angle modulation systems.
15. Threshold effects in angle modulation systems.
16. Pre-emphasis/de-emphasis filtering in angle modulated systems.
17. Binary data communication.
18. Binary data transmission in white Gaussian noise: the matched filter, optimum threshold, error probability.
19. Computation of error probabilities for some examples of coherent binary signaling: amplitude shift, phase shift, binary phase shift and frequency shift keying.
20. Effects of finite bandwidth on signaling, Nyquist’s pulse shaping criterion for minimum inter-symbol interference.
21. Introduction to information theory: entropy, channel models, channel capacity.
22. Introduction to source encoding: source entropy, examples of source coding to remove redundancy.
23. Introduction to error detecting and correcting codes.

Computer Usage: Students will complete brief computer simulation projects requiring them to write Matlab code to simulate various aspects of communication systems in the presence of noise. Students will use functions supplied to them to write Matlab code to design a simple binary data communication system and simulate its operation in the presence of noise.

Laboratory Projects: Selected examples of binary signaling techniques will be demonstrated on a portable instructional telecommunications modeling system. Students will individually complete laboratory exercises involving the effects of noise and submit a laboratory report.

Evaluation Methods:

D. Examinations and work sheets.
E. Computer simulation projects.
F. Grading of laboratory reports.

Performance Criteria: Objectives 1 through 6: Students will demonstrate understanding of the material presented in objectives by completing graded in-class examinations and work-sheets.^[6

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^f Refers to evaluation method(s) to measure student performance.
Objective 7: Students will demonstrate the ability to design simple communications links, and to carry out computer simulations of them, by writing code to simulate portions of analog and binary systems in the presence of noise.

Objective 8: Students will submit graded laboratory reports.

Additional Requirements for Graduate Students:

Graduate students taking this course are required to conduct an independent in-depth research project involving any one or more parts of a modern digital communication system. A proposal should be completed and consulted with the instructor within the first three weeks of the semester. A short presentation and an IEEE-style report are required in the last week before the Final Exam.

The project will be evaluated on the basis of theoretical results, simulation results, presentation, and report.

Prepared by:

Ping Liu, Assistant Professor
January, 2007
ENGR 5323 Power Plant Systems

2007-2008 Catalog Data:
Prerequisites: ENGR 3313, 4403 or consent. A study of the design and operation of steam-electric power plant components and systems. Fossil and renewable energy plants are emphasized. May not be taken for credit after completion of MCEG 4323.


References: Power Station Engineering and Economy; Skrotzki and Vopat, 1960, McGraw Hill (out of print) Thermodynamic and Transport Properties; Borgnakke and Sonntag, J. Wiley & Sons

Coordinator: Dr. John L. Krohn, Prof.

Prerequisites by Topic:
1. First and second laws of thermodynamics
2. Power cycle fundamentals
3. Basic fluid mechanics

Objectives:
1. To familiarize the student with the basic operation of the major components of a modern steam-electric power station. [B,C]
2. To develop a basic understanding of available energy resources. [A,E]
3. To familiarize the student with the basic methods of utilizing the energy resources identified in (2) above for producing electric power. [B]

Topics:
1. Thermodynamics review
2. Rankine cycle
3. Fossil-fueled steam generators
4. Turbine operation and design
5. Condensate-feedwater system
6. Circulating water systems - cooling towers
7. Thermal fission reactors and powerplants
8. Fast/breeder reactors and powerplants
9. Geothermal power - plant designs
10. Solar power - methods of utilization and design
11. Wind energy - wind turbines
12. Energy from the oceans - OTEC, waves, tidal power plants
13. Energy storage - storage systems and design
14. Environmental aspects of power generation

Laboratory and Computer Projects: Use of computerized property tables. Typically a field trip is taken to a nearby power plant. Students complete a
team project on a power plant design.

Graduate Credit: Graduate students will be required to complete a report on an assigned topic and present the results of their research on this topic to the class in the form of a class lecture.


Performance Criteria: Objective 1:
1.1 Students will demonstrate a basic understanding of the operation of: steam generator, steam turbine, condenser, feed water heaters, cooling towers.[1,2]
1.2 Students will demonstrate an understanding of design issues associated with each of the components listed in criteria 1.1.[2,3]
1.3 Students will demonstrate the ability to analyze steady-state operation of the above components and of a power cycle composed of these components.[1,2]

Objective 2:
2.1 Students will demonstrate a basic knowledge of each of the following energy resources: fossil fuels, nuclear power, solar, wind, geothermal, and energy from the oceans.[2]

Objective 3:
3.1 Students will demonstrate an understanding of the methods for recovering energy from each of the resources listed in 2.1.[1,2]

Prepared by: John L. Krohn, Prof.
Jan., 2007
2007-2008 Catalog Data: Prerequisites: ENGR 3503, 4433. A study of the various types of nuclear power plants including the methods used for energy conversion. Relative advantages/disadvantages of various plant types investigated. May not be taken for credit after completion of MCEG 4503.

Textbook: Nuclear Energy Conversion; M. M. El-Wakil, 1978, American Nuclear Society

References: Power Station Engineering and Economy; Skrotzki and Vopat, 1960, McGraw Hill (out of print) Thermodynamic and Transport Properties; Borgnakke and Sonntag, J. Wiley & Sons

Coordinator: Dr. John L. Krohn, Prof.

Prerequisites by Topic: 1. First and second laws of thermodynamics
2. Power cycle fundamentals
3. Basic fluid mechanics
4. Basic nuclear engineering

Objectives: 1. To familiarize the student with the design and operation of the major nuclear reactor types. [B,C]
2. To develop a basic understanding of simple steady-state and transient control of criticality. [B,C]
3. To familiarize the student with the basics of economic analysis of electric power plants. [B]
4. To familiarize the student with selected alternative and conceptual reactor designs and fuel cycles. [A,B]

Topics: 1. Survey of nuclear power systems
2. Thermodynamics of nuclear power plants
3. The boiling water reactor (BWR)
4. BWR power plants
5. The pressurized water reactor (PWR)
6. PWR power plants
7. Gas cooled reactors (GCR)
8. GCR power plants
9. The fast breeder reactor (FBR)
10. FBR power plants
11. Other reactor types
12. Fusion power
13. Nuclear power economics
14. Environmental aspects of nuclear power
Laboratory and Computer Projects: Use of computerized property tables. Typically a field trip is taken to a nearby power plant. Students complete a team project on a power plant design.

Graduate Project: Graduate students will be required to complete a research paper on an assigned topic and present the results of their research to the class in an oral presentation.

Evaluation Methods: 1. Homework  
2. Exams  
3. Project report  
4. Research report & presentation (graduate students only)

Performance Criteria:  
Objective 1:  
1.1 Students will demonstrate an understanding of the operation of the major nuclear reactor types.[1,2]  
1.2 Students will demonstrate an understanding of steam plants associated with nuclear reactors.[1,2,3]  

Objective 2:  
2.1 Students will be able to analyze simple steady-state and transient control of criticality.[1,2]  

Objective 3:  
3.1 Students will demonstrate an understanding of basic nuclear power economics. [1,2,3]  

Objective 4:  
4.1 Students will be able to describe nuclear fuel cycles – both currently in use and possible alternatives. [2]  
4.2 Students will be able to describe selected alternative and conceptual nuclear reactor designs, including current designs. [2,3]  

All Objectives:  
Students will complete a design project incorporating elements from all of the course objectives. [3]

Prepared by: John L. Krohn, Prof.  
Jan., 2007
MCEG 6503 Reactor Physics

2007-2008 Catalog Data: Prerequisites: MATH 5243 and MCEG 3503 or PHYS 3213. A study of the fundamental physical principles in the operation and design of nuclear reactors. Includes neutron-nucleus interactions, neutron energy spectra and energy dependent cross sections, neutron transport and diffusion theory, multi-group approximations, criticality calculations, and reactor analysis and design methods.


Coordinator: Dr. John Krohn

Objectives: 1. To introduce the fundamental physical principles governing operation of nuclear reactors.
2. To develop an understanding of the mathematical tools used to describe reactor principles and operations.
3. To familiarize the student with the structure and use of available nuclear data including cross section files.
4. To develop an understanding of the process of neutron moderation and modeling techniques for this process.
5. To introduce multi-group calculations and perturbation theory
6. To develop an understanding of the basics of reactor kinetics and dynamics.
8. To study the effects of core composition changes during operation
9. To introduce modern reactor analysis methods and codes and their use in the design of reactors.

Prerequisites by Topic: 1. Math through partial differential equations
2. Basic nuclear physics

Topic: 1. Fundamentals of nuclear systems
2. Mathematical description of physical phenomena: neutron transport, diffusion
3. Nuclear data and cross-section processing
4. Neutron moderation
5. Multi-group method
6. Perturbation theory
7. Reactor kinetics and dynamics
8. Core composition changes during reactor operation
9. Modern reactor analysis methods and codes
10. Nuclear reactor design principles
Laboratory and Computer Projects: Computer based numerical solution techniques are required for several of the problems encountered in this course.

Evaluation Methods: 1. Homework  
2. Exams  
3. Class Participation  
4. Project/programming assignments

Performance Criteria: Objective 1  
1.1 Students will be able to discuss qualitatively and quantitatively the fundamentals of nuclear systems. [1, 2, 3]

Objective 2  
2.1 Students will be able to analyze nuclear reactor performance in terms of quantities describing neutron-nuclear interactions. [1, 2]

Objective 3  
3.1 Students will be able to process nuclear data and prepare multi-group cross section libraries. [1, 2, 4]  
3.2 Students will be able to discuss deterministic and stochastic approaches of nuclear reactor modeling. [1, 2, 4]

Objective 4  
4.1 Students will be able to derive the neutron transport equation. [1, 2]  
4.2 Students will be able to derive the neutron diffusion equation. [1, 2]

Objective 5  
5.1 Students will be able to compute neutron distributions and multiplication factors in steady-state heterogeneous reactors using multi-group diffusion method. [1, 2, 4]

Objective 6  
6.1 Students will be able to derive the first-order perturbation theory expression for reactivity change due to change in cross sections. [1, 2]

Objective 7  
7.1 Students will be able to demonstrate analytical solutions of 1D, 2D and 3D time-dependent and time independent problems for bare homogeneous reactors. [1, 2]  
7.2 Students will be able to develop one-group diffusion models for multi-region reactors. [1, 2, 4]  
7.3 Students will be able to analytically and numerically solve simple neutron transport problems. [1, 2, 4]

Objective 8  
8.1 Students will be able to compute effects due to core composition changes during reactor operation. [1, 2]

Objective 9  
9.1 Students will develop a knowledge of modern reactor analysis codes. [2, 3]
Objective 10
10.1 Students will be able to develop models for nuclear reactor analysis and neutronics design. [1, 3, 4]
10.2 Students will be able to design heterogeneous reactors with specified characteristics. [1, 3, 4]

Prepared by: Dr. John L. Krohn, Prof.
Jan. 2007
MCEG 6513 - Radiation Measurement

2008 - 2009 Catalog Data:

MCEG 6513 - Radiation Measurement. Pre-requisites: MCEG 3512, MCEG 3523. The study of radiation techniques and equipment used by scientists and engineers. Topics of interest will include techniques and equipment for detecting ionizing radiation below about 20 MeV, Coincidence counting methods, and Reactor Laboratory experiments (as available). Lecture two hours, lab three hours.

Textbook:


Reference:

EG&G Ortec, Experiments in Nuclear Science - AN34, EG&G Ortec, 1995

Coordinator:

Dr. John Krohn

Objectives:

1. To learn radiation detection techniques and use equipment present in science and nuclear engineering laboratories. [2, 4]
2. The use of advanced counting and spectroscopy techniques and systems and their application. [4]
3. The use of reactors and their application to NAA. [4]
4. The preparation of formal lab reports. [1, 2, 3, 4]

Prerequisites by Topic:

1 – 2. Math and English skills with knowledge of electrical systems.
   Radiation Sources - Units, definitions, and types of radiation.
   Principles of operation of basic electronics, scintillation detectors,
   semiconductor detectors, GM counters.
3. Principles of proportional counters
4. Principles of solid state detectors
5 - 6. Principles of coincidence counting
7 - 11. Principles of reactor operation

Topics:

1. Review of Radiation Detection Electronics
2. Review of NaI(Tl), HPGe, and GM counters
3. Proportional counters
4. Solid State Detectors
5. Timed Coincidence Techniques and Absolute Activity Measurements
6. Gamma-Gamma Coincidence
7. Reactor Start-up
8. Neutron Activation – Thermal
9. Neutron Activation – Fast
10. Reactivity Worth of a Source / Regulating Rod, Void Coefficients
11. Axial Flux Profile

Computer Usage:

The computer is utilized as a tool in data reduction and report preparation.

Laboratory Projects:

Experiments are performed in lab.

Evaluation Methods:

A. Homework
B. Exams
C. Lab Reports

Performance Criteria:

Objective 1:
1. Students will demonstrate an ability to analyze spectra from radiation emitting sources. [A, B, C]

Objective 2:
2. Students will demonstrate an ability to use computer counting and analysis systems to analyze spectra from unknown radiation emitting sources. [C]
Objective 3:
3.1 Students will demonstrate an ability to use radiation based non-destructive testing methods to identify unknown samples. [C]

Objective 4:
4.1 Students will demonstrate an ability to communicate through the preparation of formal lab reports. [C]

Prepared by: Name: Dr. John L. Krohn Date: January 16, 2007
MCEG 6523 - Nuclear Materials

2007-2008 Catalog Data: Prerequisites: MCEG 2023 and MCEG 3503. A study of the properties of materials utilized in nuclear reactors, shielding systems and other systems exposed to radiation. Emphasis will be placed on understanding and mitigating the damage of such materials by neutron and gamma radiation. Lecture three hours.

Textbook: Nuclear Reactor Materials; Charles O. Smith, Addison-Wesley Publishing Co. (Prentice Hall)

Coordinator: Dr. Randy Culp, Professor

Prerequisites by Topic:
1. Material science fundamentals
2. Interaction of radiation with matter
3. Reactor fundamentals

Objectives:
1. To enable the student to understand the effects of radiation on materials used in the construction of nuclear systems.
2. To enable the student to select optimum materials for use in the design of nuclear systems.
3. To enable the student to understand the way of mitigating the radiation damage of materials.

Topics:
1. Reactor and isotopic power types
2. Requirements for reactor materials
3. Primary components and materials for fission reactors
4. Fundamentals of radiation effects on materials
5. Influence of radiation on material properties
6. Reactor fuels
7. Structural materials
8. Moderator, reflector, blanket and coolant materials
9. Control, shielding, and safety system materials
10. Nuclear fuel cycles, enrichment, and reprocessing
11. Radioisotopic power generators
12. Nuclear fusion reactor materials

Laboratory and Computer Projects: Students will use a computer-based program to solve the Boltzmann Transport Equations which mathematically model the fate of neutrons as they pass through various materials.

Evaluation Methods:
1. Exams
2. Graded homework problems
3. Project report

Performance Criteria: Objective 1:
1.1 Be able to explain the types of radiation.
1.2 Be able to describe the typical materials used in nuclear
reactors and other nuclear systems such as isotopic power sources.

1.3 Be able to explain the mechanisms by which the energy associated with radiation is deported within materials during collisions.

1.4 Be able to explain how material structure and properties are altered as a result of radiation exposure.

Objective 2:

2.1 Be able to select appropriate materials for specific application in nuclear systems.

Objective 3:

3.1 Be able to describe ways of preventing or minimizing exposure of nuclear systems to radiation.

3.2 Be able to explain ways of restoring integrity to materials which have been damaged by radiation.

Prepared by: Dr. Randy Culp
January, 2007
MCEG 6533 Radiation Interactions & Shielding

2007-2008 Catalog Data: Prerequisites: MCEG 3503 and MCEG 3523. Basic principles of radiation interactions, transport and shielding. Radiation sources, nuclear reactions, radiation transport, photon interactions, dosimetry, and shielding design will be covered

Textbook: Radiation Shielding; J. Shultis and R. Faw, ANS, 2000

References: Radiation Shielding and Dosimetry; A.E. Profio, J. Wiley & Sons, 1979. (0-471-04329-X)

Coordinator: Dr. John Krohn

Objectives:
1. To develop an understanding of the basic principles of radiation interactions with various materials.
2. To develop an understanding of the transport of radiation through common materials.
3. To develop an understanding of the structure and use of available radiation attenuation (cross sections) data.
4. To develop an understanding of the common devices and methods used in radiation dosimetry.
5. To develop a basic understanding of mathematical tools used to predict shielding effects of various materials.
6. To introduce methods of radiation shielding design.

Prerequisites by Topic:
1. Math through differential equations
2. Basic nuclear physics

Topic:
11. Sources of radiation
12. Interactions of charged particles
13. Interactions of electromagnetic radiation
14. Interactions of un-charged particles
15. Exact methods for radiation transport
16. Approximate methods for radiation transport
17. Radiation dosimetry
18. Radiation effects
19. Radiation shielding materials
20. Design of radiation shielding

Laboratory and Computer Projects: Computer based numerical solution techniques are required for several of the problems encountered in this course.
Evaluation Methods:
1. Homework
2. Exams
3. Class Participation
4. Project/programming assignments

Performance Criteria:
Objective 1
1.2 Students will be able to discuss qualitatively and quantitatively the interaction of various radiations with matter. [1, 2, 3]

Objective 2
2.1 Students will be able to analyze radiation transport processes using exact and approximate methods. [1, 2, 4]

Objective 3
3.1 Students will be able to process nuclear data and prepare multi-group cross section libraries. [1, 2, 4]

Objective 4
4.1 Students will be able to describe common radiation dosimetry methods and devices. [1, 2]
4.2 Students will demonstrate knowledge of basic radiation protection standards. [1, 2]

Objective 5
5.1 Students will be able to compute radiation transport and absorbed dose through single- and multiple-layer shielding. [1, 2, 4]

Objective 6
6.1 Students will be able to design basic radiation shielding. [1, 2]
6.2 Students will be able to assess shielding design through predictive calculations. [1, 2, 4]

Prepared by: Dr. John L. Krohn, Prof.
Jan. 2007
ARKANSAS TECH UNIVERSITY
Mechanical Engineering Department
Memorandum

TO: Graduate Council
FROM: Electrical and Mechanical Engineering Departments
Date: January 19, 2006

Type of Curriculum Change Requested: Addition of Program

The Departments request permission to establish a program leading to the Masters of Engineering degree.

Submitted by: Electrical and Mechanical Engineering Departments

Approved by: Department Head: __________________________

Department Head: __________________________

Dean of School: __________________________

Reviewed by: Registrar: __________________________

VPAA: __________________________
I. Catalog Listing

Master of Engineering

The Master of Engineering program provides advanced study in a focused area of engineering while also providing management training to enhance career advancement. The program contains a common core of classes including project management, organizational communication, and advanced mathematics. Required graduate courses in engineering, focusing in a particular specialization, prepare the student for advanced engineering assignments.

Students are eligible to apply for unconditional admission to the Master of Engineering degree program if they have:

1. Met the admission requirements for Graduate School

2. Completed a bachelor's degree in engineering from an ABET accredited program with a cumulative grade point average of 2.75 or greater.

3. Submitted to the Graduate School recent (within the last five years) acceptable scores (as determined by the graduate faculty in engineering) for the Graduate Record Exam (GRE).

4. Submitted a letter of intent that addresses the applicant's intended focus and reasons for applying to the degree program. Based upon an applicant's intended program focus, deficiency courses may be identified to be completed before enrollment in some engineering graduate courses.

5. Provided two letters of recommendation, using the form provided by the department, from professors familiar with the applicant's academic ability.

Applicants with a bachelor's degree in a closely related field (e.g. engineering physics, etc.) may petition the appropriate department head for unconditional admission. Such petitions will be judged on the scholastic performance and course content in the bachelor's degree program.

Applicants not meeting the unconditional admission requirements will be considered on a case-by-case basis for conditional admission into the program. Any deficiencies identified for conditional admits should be satisfied within the first calendar year of enrollment.

Each student is required to have a graduate advisor who is a member of the electrical or mechanical engineering departments and the graduate faculty. A formal letter from the advisor to the head of the student's major department acknowledging the advisor’s willingness to serve as the student’s graduate advisor is required during the student’s first semester of course work in the program. The advisor and two additional qualified personnel, selected by the student and advisor, will serve as the student’s Graduate Advisory Committee. At least two committee members must be faculty in engineering. The student and advisor will work to develop a
program of study which must be submitted for approval with the application for candidacy as discussed below.

Students admitted to the program unconditionally are eligible for admission to candidacy upon the completion of twelve graduate hours with a 3.00 or greater grade point average. Students who have been admitted to the program conditionally must, in addition to the grade point requirement, have satisfied all deficiencies. By the end of the eighth week of the semester in which candidacy requirements will be met, students shall submit to the head of the student’s major department an “Application for Admission to Candidacy” including a degree completion plan endorsed by the student’s Graduate Advisory Committee. Students failing to submit these documents prior to the stated deadline will not be allowed to register for subsequent graduate classes.

Degree Requirements

1. A minimum of 36 semester credit hours of coursework at the graduate level must be completed which includes 12 semester hours in the common core, 12 semester hours in the chosen focus area and an additional 12 semester hours of electives. A minimum of 18 semester hours must be engineering courses (ELEG or MCEG prefix) and a minimum of 18 semester hours must be at the 6000 level.

Common Core (12 hours):

MGMT 5203 – Project Management
SPCH 5063 – Organizational Communication
MATH 5243 – Differential Equations II
3 hours from:
   MATH 5103 – Linear Algebra
   MATH 5153 – Applied Statistics II
   MATH 5273 – Complex Variables

Focus Area (12 hours):

Twelve semester hours of graduate coursework forming a cohesive focus area shall be chosen in consultation with the student’s graduate advisor, subject to approval of the appropriate department head and the Dean of Graduate School.

Elective courses (12 hours):

Any 5000 or 6000 level MCEG or ELEG course
PHYS 5113 – Advanced Physics Lab
MATH 5103, 5153 or 5273 if not used in the common core

2. A minimum cumulative grade point average of 3.00 must be achieved on all graduate work attempted at Arkansas Tech University. A maximum of six semester hours of “C” grades can be counted toward degree requirements. Students receiving more than six hours of
“C” grades or more than three hours of “D” or “F” grades is subject to dismissal from the program. (Refer to “Academic Probation and Suspension” in the graduate catalog.)

3. Successful completion of a comprehensive final examination, consisting of both a written and oral portion and administered by the student’s Graduate Advisory Committee, is required in addition to the coursework requirements above. This exam will be administered during the student’s final semester and may be attempted a maximum of three times.

4. Completion of all requirements of the degree must be accomplished within six years from the time of admission to the program.

Special Conditions of Graduate Credit

A maximum of nine semester hours of graduate credit with a grade point average of “B” or better may be transferred from an accredited graduate school if deemed appropriate to the graduate program by the head of the student’s major department and the Dean of Graduate School. Students must submit a written request to the head of their major department to petition acceptance of the transfer credit prior to requesting admission to candidacy to the graduate program. Graduate credit earned six years prior to the completion date of all degree requirements may not be applied toward the degree without the approval of the head of the student’s major department and the Dean of Graduate School. Credits earned by correspondence courses or for remedial purposes will not apply toward the graduate degree. No undergraduate course may be repeated for graduate credit.

If, after admission to graduate study, a student wishes to take a course at another institution to count toward degree requirements at Arkansas Tech University, the student must obtain written approval from the head of the student’s major department and the Dean of Graduate School prior to enrolling in the course.
II. Course Information

A. Rationale for requested change

Please refer to the program proposal to be submitted to the Arkansas Department of Higher Education, a copy of which is attached.

B. Impact of change

The establishment of the proposed program will require the addition of one new tenure-track faculty member to the Department of Mechanical Engineering during the first year and an additional faculty member in the third year of the program. In addition, the creation of up to four new graduate assistantships is being requested. Space allocation will be slightly affected by the need for one or two new faculty offices. This need is anticipated to be met by remodeling of space in the CES building. The primary impact on budgeting will be the additional faculty member(s) in ME with an additional impact due to those graduate assistant positions that are created. Minor adjustments to the supplies budget may be needed after program initiation. The primary impact on other programs will be an increase in graduate student enrollment in selected courses in the Math, Physical Science, Management and Speech departments.

C. Effective Date

The proposed program would begin in the Fall, 2007 semester.

D. Departments Consulted

<table>
<thead>
<tr>
<th>Department/School</th>
<th>Support for Proposal</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. School of Business/Dr. Tom Tyler</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td>2. Physical Science/Dr. Jeff Robertson</td>
<td>yes</td>
<td>12/13/06</td>
</tr>
<tr>
<td>3. Speech/Dr. Donna Vocate</td>
<td>yes</td>
<td>12/14/06</td>
</tr>
<tr>
<td>4. Mathematics/Dr. Don Carnahan</td>
<td>yes</td>
<td>12/15/06</td>
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III. Assessment Plan

See the Assessment section of the ADHE proposal.

A University Assessment Form for the proposed program is attached.

Course syllabi supporting this program are included in a separate submittal.
PROPOSAL FOR NEW DEGREE
ARKANSAS TECH UNIVERSITY

Master of Engineering

Academic Affairs Office
Arkansas Tech University
Russellville, AR 72801

Spring 2007
PROPOSAL FOR NEW DEGREE
ARKANSAS TECH UNIVERSITY

Master of Engineering

1. PROPOSED PROGRAM TITLE: Master of Engineering

2. CIP CODE REQUESTED: 14.0101

3. CONTACT PERSON

Dr. John Watson, Dean
School of System Science
Arkansas Tech University
Corley 112
jwwatson@atu.edu
(479) 968-0353

4. PROPOSED STARTING DATE: Fall 2007

5. PROGRAM SUMMARY

This 36 semester hour master's program is intended for students who have completed a baccalaureate degree in engineering or a closely related area such as engineering physics. The program affords the student the opportunity for advanced study leading to enhanced career opportunities while at the same time providing industries in the Arkansas Tech service area with a more highly qualified workforce. The program will consist of advanced courses in engineering combined with support courses in mathematics, business management, physics, and communications. Those who complete the program should be able to advance their career into project management or team leader positions.

Existing degree programs that will support the proposed program include: Mechanical Engineering, Electrical Engineering, Physics, Marketing and Management, and Speech and Communications.

6. NEED FOR PROGRAM

Need for Graduate Engineering Degree:

Arkansas Tech University has offered Bachelor of Science degrees in Engineering since 1970 with initial accreditation by the Engineering Accreditation
Commission (EAC) of the Accreditation Board for Engineering and Technology (ABET) coming in 1988. In 1998 the University began offering separate bachelors degrees in electrical and mechanical engineering. Both programs have proven successful gaining EAC of ABET accreditation, producing an average of 37 graduates per year for the last five years and currently enrolling over 300 undergraduate students. Arkansas Tech's engineering programs are contributing to the educational and economic development of Arkansas.

Historically, a bachelor's degree has been recognized as the required degree for entry into the engineering work-force and into the professional licensure process. Continuing education has always been recognized as an important part of an engineer's career. This fact is made clear by the inclusion of "life-long learning" as an expected attribute of engineering graduates under the current accreditation standards and continuing education requirements for most state's professional engineers. In recent years, there has been a growing impetus to extend the educational process for engineers beyond the traditional, four-year bachelor's degree. There has been much discussion in the engineering education community on the proper level for the "first professional degree" in engineering with a growing number seeming to favor the master's degree. The National Council for Examination for Engineering and Surveying recently modified its "Model Law" to require 30 hours of education beyond the bachelor's degree for individuals seeking registration as Professional Engineers. If adopted by the various state licensing boards, this new requirement will greatly increase the number of students seeking master's level degrees in engineering.

Engineering continues to be a growth field for employment. The U.S. Department of Labor Occupational Projections for the period 2004-2014 predicts total growth in virtually all engineering fields. Of particular interest to the proposed program, the report projects 13 percent growth for engineering managers in the period with a total increase in employment of 25,000 positions nationwide. On a local level, the same report predicts an equivalent 13 percent growth in engineering managers within Arkansas with 30 average annual openings and a total of 130 new positions during the 2004-2014 time period.

Need for Nuclear Engineering:

The proposed program includes 12 semester hours in a focus area within engineering. The initial focus area being developed is in nuclear engineering.

Nuclear power seems poised for a dramatic rebound as a source of new electric generating capacity in the United States. Due to improved performance of existing plants, incentives such as those included in the National Energy Policy Act of 2005 and increased concerns over environmental impacts, especially global warming, there is today a very good chance that construction on a new nuclear power plant will begin in

1Licensure Exchange, NCEES, Vol. 10, Issue 4

the U.S. in the very near future. In a 2006 survey of utility executives, nearly half (45%) expected a new nuclear plant order to be placed within the next 1-3 years. This is reflected in recent articles appearing in a broad range of publications from industry related (Nuclear News) and higher education related (Chronicle of Higher Education, ASEE Prism) to mainstream newspapers and magazines (Time, etc.). Even historic opponents of nuclear power have begun to endorse increased use of this energy supply including such as Greenpeace founder Patrick Moore and the Progressive Policy Institute (the policy arm of the Democratic Leadership Council which includes nationally prominent Democrat politicians including Senators Evan Bayh of Indiana and Hillary Rodham Clinton of New York).

Interest in nuclear engineering as a career field has also grown in recent years. Undergraduate enrollment in nuclear engineering programs has more than doubled in the past five years as students anticipate increased hiring. Reactor design and construction firms have already begun to increase staffing and anticipate hiring large numbers of engineers, nuclear and otherwise, in the next few years. As of the end of 2006, over one dozen utilities and consortia have announced tentative plans for submitting construction and operating license applications for over two dozen new nuclear power plants in the years 2007-2010. While there have been no discussions of new plants in Arkansas, Entergy is involved in plans for two new plants in neighboring states.

Other focus areas under consideration are engineering management, materials science and electronics systems. Feedback from the Arkansas Tech Engineering Advisory Board and the program interest survey have indicated interest in these areas.

Interest in program:

Arkansas Tech University created a survey to gauge local interest in the possibility of a Master's of Engineering program. The text of the survey is included in an appendix to this proposal. Results from the initial 32 respondents to the survey show strong interest in the establishment of such a program. Over two dozen engineering employees of Arkansas Nuclear One, located in Russellville, have indicated that they are "likely to enroll" in the program if established. A majority of these employees indicated that an advanced degree would be beneficial to their career and virtually all respondents indicated employer support for advanced studies through tuition reimbursement, raises or bonuses.

Additional responses to the survey from electrical and mechanical engineers across Arkansas are expected prior to submittal of this proposal to the Arkansas Department of Higher Education.

7. CURRICULUM OUTLINE

The curriculum for the proposed program consists of a 12 hour common core of classes that will be required of all students regardless of focus area, 12 hours of engineering course work chosen to form a cohesive focus area and 12 hours of
additional electives. At the present time, only nuclear engineering courses are proposed to fulfill the focus area requirements. Other areas will be added as student interest and faculty expertise allow. The common core for all Master's of Engineering degree plans consists of:

MGMT 5203 – Project Management*
SPCH 5063 – Organizational Communication
MATH 5243 – Differential Equations II*
3 hours from:
   MATH 5103 – Linear Algebra II
   MATH 5153 – Applied Statistics II
   MATH 5273 – Complex Variables

Twelve semester hours of graduate engineering coursework forming a cohesive focus area will be chosen in consultation with the student's graduate advisor to fulfill the focus requirement. As noted earlier, the initial focus area to be developed will be nuclear engineering. The initial courses offered in nuclear engineering are:

MCEG 6503 – Reactor Physics
MCEG 6513 – Radiation Measurement
MCEG 6523 – Nuclear Materials
MCEG 6533 – Radiation Interactions and Shielding

An additional 12 hours of elective courses completes the program. A maximum of six hours of 6891-6, Independent Study, credits may be used within the 12 hour elective block. Courses eligible to be used as electives are:

Any 5000 or 6000 level MCEG or ELEG course
PHYS 5113 – Advanced Physics Lab*
MATH 5103, 5153 or 5273 if not used in the common core

A minimum of 18 semester hours of coursework must be in engineering and a minimum of 18 hours must be at the 6000 level. Students will be required to successfully complete a comprehensive written and oral exam as part of their degree program. Students will be eligible for admission to candidacy after completing 12 hours of graduate course work. At the time of application for candidacy, the student and graduate advisor will submit a degree completion plan for review and approval by the student's Graduate Advisory Committee, the head of the student's major department and the Dean of Graduate School.

Admission requirements:

Admission to the program is based on the following qualifications: a bachelor's degree in engineering from an ABET accredited program with an undergraduate grade point average of 2.75 or greater, an acceptable score on the Graduate Record Exam

*Courses marked with an asterisk (*) currently exist in the Arkansas Tech University course inventory as 4000 level courses only. The appropriate departments have indicated their intent to establish the corresponding graduate level courses upon approval of this proposal.
and a letter of intent addressing the student's intended focus area and reasons for applying for graduate admission. Applicants with a bachelor's degree in a closely related field (e.g. engineering physics, etc.) may petition the appropriate department head for unconditional admission. Such petitions will be judged on the scholastic performance and course content in the bachelor's degree program.

Applicants not meeting the unconditional admission requirements will be considered on a case-by-case basis for conditional admission into the program. Any deficiencies identified for conditional admits should be satisfied within the first calendar year of enrollment.

Degree completion plan:

The program is designed for completion by a full-time student in four, nine-hour semesters. In general, the order of completion of the courses will be determined only by pre-requisite requirements for each course. However, students are encouraged to complete the common core as early as practicable in their program. Additionally, MATH 5243 – Differential Equations II, should be taken during the first year.

A sample program completion schedule is given below:

First year:
- Fall
  MATH 5243 – Diff. Eqns. II
  SPCH 5063 – Organizational Comm.
  MCEG 5xx3 – ME elective
- Spring
  MCEG 6503 – Reactor Physics
  MGMT 5203 – Project Management
  PHYS 5113 – Advanced Physics Lab

Second year:
- Fall
  MCEG 6533 – Rad. Interactions & Shielding
  MCEG 5xx3 – ME elective
  MCEG 6513 – Radiation Measurement
- Spring
  MCEG 6523 – Nuclear Materials
  MATH 5xx3 – Math elective
  MCEG 6903 – Engineering Project

Transfer work and distance technology offerings:

A maximum of nine hours of transfer graduate work may be accepted toward completion of program requirements subject to review and approval of the head of the student’s major department and Dean of Graduate School. Courses offered by other Universities delivered by distance technology to the Arkansas Tech campus will be considered transfer courses. None of the Arkansas Tech courses are presently proposed for delivery by distance technology.

Course evaluation:

Course evaluations will be conducted in each graduate course offered by the engineering departments at Arkansas Tech. These will be conducted using the
standard course evaluation form in use at Arkansas Tech at the time of the course offering. A copy of the current course evaluation form is included in an appendix.

Program assessment:

The proposed program will be assessed by two main methods. First, student learning objectives for each course are assessed by the course instructor at the completion of each course. These learning objectives are included in the course syllabi presented herein. Secondly, each student is required to successfully complete a comprehensive exam at the conclusion of the program. The results of this exam will be used to provide an overall assessment of the program.

New courses:

All 6000 level engineering courses proposed for use in this program will be newly developed courses at Arkansas Tech. Syllabi for those courses proposed at this time are included in an appendix. All 5000 level engineering courses will be developed from existing 4000 level engineering courses. These syllabi are also included in the appendix. The MGMT 5203, MATH 5243 and PHYS 5113 courses will be developed from existing courses in their respective departments. Syllabi for these courses will be developed following approval of this proposal.

8. FACULTY

The faculty of the Department of Mechanical Engineering consists of five tenure-track faculty members with terminal degrees and one instructor. All MCEG courses will be taught by the tenure-track faculty of the department or similarly qualified adjunct faculty approved by the Graduate School. Curriculum vita for all proposed graduate MCEG faculty members are contained in an appendix to this proposal.

The department anticipates adding additional full-time tenure-track faculty positions in August, 2007 and August, 2008. These positions will require a terminal degree in mechanical or nuclear engineering.

9. DESCRIPTION OF RESOURCES

Library Resources:

The Pendergraft Library and Technology Center subscribes to many online databases that can be used to find journal or periodical articles, many of these databases provide access to articles in full-text.

General Subject Article Databases

1. Academic Search Elite – This database covers may subject areas, including engineering, and has many articles in full-text.
2. ArticleFirst – This is a citation only database in FirstSearch that is very comprehensive and international in scope.

3. Government Periodicals Index – This database is a LexisNexis product and indexes Federal Government periodicals. It has links to the full-text if the periodical is online and many are online.

4. GPO – This is a database in FirstSearch that indexes U.S. Government publications. It includes Corps of Engineers and National Institute of Standards publications.

5. Research Library – This is a Proquest source that covers many subject areas and has many full-text articles.

6. WilsonWeb – This H. W. Wilson database covers many subject areas and has many full-text articles.

Subject Specific Article Databases

1. ANTE: Abstracts in New Technologies and Engineering – This is a CSA citation only database, with links to full-text in other ATU subscribed databases. It covers materials about new developments in technology and engineering.

2. Applied Science and Technology Index – This is a Wilson Web (Omnifile) database and has citations and some full-text articles. To limit searching to just this database in WilsonWeb, check the Omnifile box on the main web page, then another drop down box will appear, choose Applied Science.

3. CSA Materials Research Database with METADEX – This is a CSA citation only database, with links to full-text in other ATU subscribed databases. It covers materials science, metals and alloys, engineered materials and ceramics.

4. Mechanical and Transportation Engineering Abstracts – This is a CSA citation only database, with links to full-text in other ATU subscribed databases. It covers transportation systems engineering for industrial and management purposes.

5. Mechanical Engineering Abstracts – This is a CSA citation only database, with links to full-text in other ATU subscribed databases. It covers the worldwide literature in mechanical engineering, engineering management, and production engineering.

6. MicroPatent Materials Patents – This is a CSA citation only database. It provides access to patent information for all fields of engineering, both U.S. and International.

7. Solid State and Superconductivity Abstracts – This is CSA citation only database, with links to full-text in other ATU subscribed databases. It provides global coverage for all aspects of theory, production, and application of solid state materials and devices.

8. Web of Science – This is a citation only database from Science Citation Index. It is a comprehensive database on science and does include engineering.

We have access to Access Science, which is the online equivalent of the McGraw-Hill Encyclopedia of Science and Technology, so students and faculty can look up science and engineering terms for an essay on a term.
The library also has access to a database called WorldCat in FirstSearch that indexes book and audiovisual materials found in libraries in the U.S. and around the world. Books found in this database that are not owned by ATU can be borrowed on Interlibrary Loan, a free service provided by the Library where books are requested from the owning library by Library Staff, and once received are checked out to the student or faculty member who requested the book(s).

Journal or periodical articles that are not available either from ATU subscriptions or available in electronic format from ATU subscribed databases, may be requested by Interlibrary Loan as well.

There is a link from the Library's main web page http://library.atu.edu for requesting materials by Interlibrary Loan.

Instructional facilities:

The Departments of Electrical and Mechanical Engineering are housed in the Center for Energy Studies building on the Arkansas Tech campus. The CES building includes two classrooms equipped with a computer, LCD projector, VCR and Elmo presentation system. The departments also have access to classrooms in the Corley and Dean classroom buildings. The CES building contains a small computer lab for use between classes and students have access to all engineering software on computers located in the Corley computer labs and in the Pendergraft Library and Technology Center. The Electrical and Mechanical Engineering departments have eleven laboratory areas with over 11,000 square feet of floor space and nearly $1.5 million in equipment. A brief description of these lab areas is included in an appendix.

New resources required:

Only minimal new resources are anticipated to be necessary for beginning the proposed program. Some new lab equipment may be added as deemed necessary. The department currently has over $100,000 on deposit with the Arkansas Tech Foundation (given by interested contributors) that is available to assist with acquisition of such equipment.

10. NEW PROGRAM COSTS

New administrative costs:

No new administrative costs will be required for the proposed program. The program will be administered by the current Dean, Department Heads and Administrative Assistant.

Number of new faculty and costs:
One additional faculty is expected for the Fall, 2007 semester at an approximate cost of $55,000 plus benefits. With expected program enrollment and growth, another additional faculty member is projected for the Fall, 2008 semester at an approximate cost of $56,650 plus benefits.

New library resources and costs:

The departments' current library acquisition budgets should be sufficient for any new materials obtained to support the proposed program.

New/renovated facilities and costs:

Initially, no new facilities are requested to support the proposed program. Some minor renovation of existing space may be required to support new faculty. If needed, this renovation will be done by the University physical plant. Additional space may be desirable in the future dependent upon the growth of the proposed program and any growth in the associated bachelor's programs.

New instructional equipment and costs:

Additional radiation measurement equipment will be obtained to support MCEG 6513. The department anticipates purchasing new NaI counting system in the first year at an approximate cost of $5,000 and a new HPGe detector system during the second year at an approximate cost of $25,000. Additional computers and software are anticipated for the third year at an approximate cost of $15,000. As noted above, the department currently has funds earmarked for such support of the proposed program.

Distance delivery costs:

At present, no courses are planned for distance delivery.

Other new costs:

The current Administrative Assistant will provide secretarial support for the proposed program. The departments' current supplies and faculty development budgets will serve the proposed program also. The supplies budgets will be supplemented by the existing $0.90 per credit hour fee received from students.

11. SOURCES OF FUNDING

Funding for the proposed program will come from three main sources: new state money, tuition and fees, and private donations. The costs of the proposed new faculty and a portion of the costs for graduate assistants will be covered by additional budget allocations from the Arkansas Tech budget. These funds will derive from a combination of tuition and fees received from students in the program, and new state funds. Remaining program costs, such as additional supplies, travel and remaining costs of graduate assistants will come from student fees (the per credit hour fee discussed
above and lab fees for some of the proposed courses) and from private donations which have already been received.

The proposed program costs and funding are summarized in the table below:

<table>
<thead>
<tr>
<th>Resource Requirements</th>
<th>1st Year</th>
<th>2nd Year</th>
<th>3rd Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staffing:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Administrative/Professional</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Full-time Faculty 1/1/0</td>
<td>$71,500</td>
<td>$73,645</td>
<td>$0</td>
</tr>
<tr>
<td>Part-time Faculty</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Graduate Assistants</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Clerical</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Equipment &amp; Instructional Materials</td>
<td>$5,000</td>
<td>$25,000</td>
<td>$15,000</td>
</tr>
<tr>
<td>Other Support Services:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supplies/Printing</td>
<td>$500</td>
<td>$750</td>
<td>$1,000</td>
</tr>
<tr>
<td>Travel</td>
<td>$1,600</td>
<td>$2,400</td>
<td>$3,200</td>
</tr>
<tr>
<td>Distance Technology</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Other Services (space renovation)</td>
<td>$0</td>
<td>$0</td>
<td>$25,000</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$78,600</td>
<td>$101,795</td>
<td>$44,200</td>
</tr>
</tbody>
</table>

**Planned Funding Sources**

<table>
<thead>
<tr>
<th>Source</th>
<th>1st Year</th>
<th>2nd Year</th>
<th>3rd Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Student Tuition and Fees*</td>
<td>$22,440</td>
<td>$44,880</td>
<td>$56,100</td>
</tr>
<tr>
<td>New State General Revenue</td>
<td>$55,000</td>
<td>$56,650</td>
<td>$0</td>
</tr>
<tr>
<td>Redistribution of State General Revenue</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>External Grants/Contracts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Funding Sources – Private Donation</td>
<td>$1,160</td>
<td>$265</td>
<td>$0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$78,600</td>
<td>$101,530</td>
<td>$56,100</td>
</tr>
</tbody>
</table>

*Based on 10/20/25 students taking an average of 12 hours per year at 2006-07 tuition.

12. ORGANIZATIONAL CHART REFLECTING NEW PROGRAM

The proposed program will be housed in the School of System Science and the Departments of Mechanical Engineering and Electrical Engineering. A current Arkansas Tech University organizational chart is included.
13. SPECIALIZED REQUIREMENTS

No specialized accreditation requirements for the program will be sought or required. As noted previously, the electrical and mechanical engineering bachelor's degree programs are both accredited by the Engineering Accreditation Commission of the Accrediting Board for Engineering and Technology. Current ABET policy permits institutions to seek accreditation at only one level (basic or advanced) and thus the proposed program is not eligible to seek ABET accreditation.

14. BOARD OF TRUSTEES APPROVAL

15. SIMILAR PROGRAMS

There are no existing Master of Engineering programs within Arkansas. Within the region, such programs are listed at the following institutions: University of Missouri – Columbia, University of Missouri – Rolla, Oklahoma State University, Baylor University, Texas A&M University. All of these institutions plus many more have Master of Science programs in various engineering fields including the University of Arkansas at Fayetteville. To our knowledge, the MS programs are predominate at all of the mentioned schools. While the proposed program is not unique to the area, it is unique to Arkansas and the program’s emphasis on management and communications is fairly unique within the region.

16. DESEGREGATION

Arkansas Tech University strives to promote diversity among its student body and does not discriminate against students based on gender or ethnic background. While it is not anticipated that the proposed program will attract a significantly higher proportion of minority students, it is anticipated that the program will attract a higher proportion of foreign national applicants than the current undergraduate programs.

17. INSTITUTIONAL AGREEMENTS/MEMORANDUM OF UNDERSTANDING

The courses proposed in this program will be primarily provided by Arkansas Tech University. The schools of the Big 12 athletic conference are currently establishing a consortium to provide for sharing of nuclear engineering courses. Arkansas Tech plans to investigate possible collaborations with these schools.
TO: Graduate Council

FROM: Electrical and Mechanical Engineering Departments

Date: January 19, 2006

Type of Curriculum Change Requested: Course Additions

The Departments request permission to add the following graduate courses in support of the proposed Masters of Engineering degree program:

ELEG 5113 – Digital Signal Processing
ELEG 5133 – Advanced Digital Design
ELEG 5153 – Communication Systems II
MCEG 5323 – Power Plant Systems
MCEG 5503 – Nuclear Power Plants I
MCEG 6503 – Reactor Physics
MCEG 6513 – Radiation Measurement
MCEG 6523 – Nuclear Materials
MCEG 6533 – Radiation Interactions and Shielding
✓ MCEG 6881-4 – Workshop
MCEG 6891-6 – Independent Study

Submitted by: Mechanical Engineering Department

Approved by: Department Head: ___________________________
.Department Head: ___________________________
Dean of School: ___________________________

Reviewed by: Registrar: ___________________________
VPAA: ___________________________
I. Catalog Descriptions

ELEG 5113 – Digital Signal Processing. Prerequisites: ELEG 3123 and 3133. The study of discrete-time signals and systems, convolution, correlation, z-transform, discrete-time Fourier transform, analysis and design of digital filters. Students write software for real-time implementation of selected signal processing algorithms using DSP microcomputer hardware. May not be taken for credit after completion of ELEG 4113.

ELEG 5133 – Advanced Digital Design. Prerequisites: ELEG 2131, 2133. A project oriented course in which students develop and test custom digital integrated circuits (IC’s). An overview of IC design systems and manufacturing processes is presented. Economics of IC production are discussed. Hardware Description Languages (HDL’s) are studied. Students design and implement custom IC’s using schematic based entry and HDL’s. May not be taken for credit after completion of ELEG 4133.

ELEG 5153 – Communication Systems II. Prerequisites: ELEG 4143. Continuation of ELEG 4143. Design and analysis of analog and digital communication systems, taking into account the effects of noise. Random variables, random processes, analog and digital communication systems in the presence of noise. May not be taken for credit after completion of ELEG 4153.

MCEG 5323 – Power Plant Systems. Prerequisites: MCEG 3313, 4403. A study of the design and operation of steam-electric power plant components and systems. Fossil and renewable energy plants are emphasized. May not be taken for credit after completion of MCEG 4323.

MCEG 5503 – Nuclear Power Plants I. Prerequisites: MCEG 3503, MCEG 4403. A study of the various types of nuclear reactor plants including the methods used for energy conversion. Relative advantages/disadvantages of various plant types investigated. May not be taken for credit after completion of MCEG 4503.

MCEG 6503 – Reactor Physics. Prerequisites: PHYS 3213, MCEG 3503, MATH 5243. A study of the fundamental physical principles in the operation and design of nuclear reactors. Includes neutron-nucleus interactions, neutron energy spectra and energy dependent cross sections, neutron transport and diffusion theory, multi-group approximations, criticality calculations, and reactor analysis and design methods.

MCEG 6513 – Radiation Measurement. Prerequisites: MCEG 3503, MCEG 3512. The study of radiation techniques and equipment used by scientists and engineers. Topics of interest will include techniques and equipment for detecting ionizing radiation below about 20 MeV, Coincidence counting methods, and reactor laboratory experiments (as available). Lecture two hours, lab three hours.

MCEG 6523 – Nuclear Materials. Prerequisites: MCEG 2023 and MCEG 3503. A study of the properties of materials utilized in nuclear reactors, shielding systems and other systems exposed to radiation. Emphasis will be placed on understanding and mitigating the damage of such materials by neutron and gamma radiation.
MCEG 6533 – Radiation Interactions and Shielding. Prerequisites: MCEG 3503, MCEG 3523. Basic principles of radiation interactions, transport and shielding. Radiation sources, nuclear reactions, radiation transport, photon interactions, dosimetry, and shielding design will be covered.

✓ MCEG 6881-3 – Workshop. Prerequisite: permission of instructor. The workshop will require the equivalency of fifteen clock hours of instruction per credit hour.

MCEG 6891-6 – Independent Study. Prerequisite: completion of 18 hours toward program requirements, approval of advisor. Students will complete an engineering project approved by their Advisory Committee. The project must include elements of engineering design and project management with a subject relevant to the student’s program of study. Successful completion of the project will include a professional report and full presentation of the project findings/results.

Titles for Course Inventory:
ELEG 5113 – Digital Signal Process
ELEG 5133 – ASIC Design
ELEG 5153 – Communications Sys II
MCEG 5323 – Power Plant Systems
MCEG 5503 – Nuclear Power Plants I
MCEG 6503 – Reactor Physics
MCEG 6513 – Radiation Measurement
MCEG 6523 – Nuclear Materials
MCEG 6533 – Rad. Interact. & Shield.
MCEG 6881-3 - Workshop
MCEG 6891-6 – Independent Study

Effective date or term: All courses are requested to be added to the course inventory for the Fall, 2007 semester.

Course Fees: Radiation Measurement (MCEG 6513) will carry a $50 fee for lab supplies.
II. Justification and Feasibility of Courses

A. Need for course and potential students

These courses are needed to support the proposed Masters of Engineering degree program. MCEG 6503, 6513, 6523 and 6533 are new courses which would constitute the bulk of a nuclear engineering focus area. Corresponding 4000 level ELEG or MCEG courses exists for the proposed 5000 level courses. Potential students are candidates for the Masters of Engineering degree.

B. Relation to existing courses

The proposed 5000 level courses are graduate counterparts to existing 4000 level courses currently offered. These courses will not be eligible to be taken for credit by students who have previously taken the corresponding 4000 level course. The proposed 6000 level courses are related to existing 3000 and 4000 level elective courses which are used to support the current nuclear technology program. The proposed courses are typical of master’s level courses in nuclear engineering programs.

C. Course relation to departmental development plan

The proposed courses are vital to the departments’ plan to establish a Masters of Engineering degree program. The proposed courses represent the bulk of the courses in a nuclear engineering focus area within the proposed degree program.

D. Course offerings

The proposed 5000 level courses are currently being offered every third or fourth semester as 4000 level electives and this frequency is planned to continue. The departments plan to offer each 6000 level course once every two years. If program enrollment dictates, this frequency could increase to once per year.

E. Course staffing

The proposed 5000 level courses are currently being staffed by the existing electrical and mechanical engineering faculty. The 6000 level courses will be taught by existing faculty and/or new faculty members. One new full-time tenure-track faculty member will be added to the Mechanical Engineering Department in the Fall, 2007 semester.

III. Assessment Integration

The proposed 5000 level courses have existing 4000 level complements. These courses have established learning objectives and are integrated into the departments’ undergraduate program assessment plans. These same course learning objectives will be used for the 5000 level courses and will be implemented into the graduate program assessment plan in a similar fashion. The 6000 level courses have learning objectives and assessment methods for these objectives stated in the attached syllabi. These objectives will be assessed as part of the program assessment plan. The full integration can be seen in the program assessment document prepared and submitted with the request for establishment of the graduate program.
Course Syllabi

Syllabi for each of the proposed graduate courses are attached.
ENGR 5113 Digital Signal Processing

2006-07 Catalog Data: Prerequisites: ENGR 3123 and 3133 or ENGR 3223. The study of discrete-time signals and systems, convolution, correlation, z-transform, discrete-time Fourier transform, analysis and design of digital filters. Students write software for real-time implementation of selected signal processing algorithms using DSP microcomputer hardware. Lecture three hours.


Coordinator: Charles Wu, Assistant Professor, Electrical Engineering

Objectives: For each student to:
1) Understand the basic properties of discrete-time signals and systems. [1]*

2) Be able to analyze discrete-time linear time-invariant systems in the time-domain. [1, 3]

3) Effectively use mathematical transforms in the analysis of linear systems. [1, 3]

4) Understand the effect of analog-to-digital and digital-to-analog conversion in both time and frequency-domain. [1]

5) Solve linear difference equations in both the time and transform domains. [1]

6) Realize discrete-time systems using basic operations. [1, 3]

7) Be familiar with efficient implementations of discrete Fourier transform. [1, 3]

8) Use software tools for the design of digital filters. [3]

Topics:
1. Discrete-time systems, properties, difference equations, Fourier series representations, sampling.

* Refers to the number of the educational objective(s) of the program leading to the BSEE degree at Arkansas Tech University that applies to course objective.
2. Z-Transform, inverse, properties, applications.

3. Network realizations, basic forms (direct I/II, cascade, parallel), transposed forms, IIR, FIR, quantization effects.

4. Discrete Fourier transform, series and properties, circular convolution.

5. Fast Fourier transform, decimation in time/frequency algorithms.

6. Design of IIR filters, difference equation, impulse invariance, bilinear transformation.

7. Design of FIR filters, windows, frequency sampling, equiripple approximation.

Computer Usage: Students will use MATLAB to conduct filter design, prototype system analysis and simulation.

Laboratory Project: A final design project is assigned in which a digital filter is designed, simulated, and modified if necessary. The filter is constructed in the laboratory if time permits. Students taking this course for graduate credit will complete an additional project and present the results to the class.

Evaluation Methods: A. Examinations  
B. Final design project  
C. Oral presentation of design project results

Performance Criteria: Objectives 1 through 7: Students will demonstrate understanding of DSP techniques and their application by completing in-class examinations and design work-sheets. [A]\textsuperscript{b}

Objective 8: Each student will present an oral report on the final design project and will submit a formal written report describing the project. These will be graded on criteria supplied to the student in advance.[B,C]

Prepared by: Charles Wu  
Jan. 2007

\textsuperscript{b} Refers to evaluation method(s) to measure student performance.
ELEG 5133: Advanced Digital Design

2006-2007 Catalog Data: Prerequisites: ELEG 2131, 2133. A Project oriented course in which students develop and test custom digital integrated circuits (IC’s). An overview of IC design systems and manufacturing processes is presented. Economics of IC production are discussed. Hardware Description Languages (HDL’s) are studied. Students design and implement custom IC’s using schematic based entry and HDL’s. Lecture one hour per week, project work two hours per week.


Coordinator: Carl Greco, Ph.D., Associate Professor

Prerequisites by Topic:
1. Knowledge of basic circuits and digital electronics
2. Knowledge of basic combinational and sequential logic design
3. Knowledge of basic HDL-based digital design

Objectives:
1. To impart a basic understanding of modern IC design and fabrication processes and the economics of those processes. [3]
2. To gain proficiency in the use of computer-aided design systems for IC design and implementation. [3]
3. To develop a comprehensive knowledge of Hardware Description Language sufficient to synthesize complex digital circuits. [3]
4. To acquire practical design experience through team-based design projects in the laboratory. [2,3]

Topics:
1. Types of custom IC’s
2. Economics of IC’s
3. Hardware Description Languages
4. Design entry using CAD
5. Design for simulation
6. Design for synthesis
7. Implementation using FPGA’s and CPLD’s
8. Routing and floorplanning
9. Testbenches for HDL

Laboratory and Computer Projects: Extensive use of computers in design, simulation, synthesis, implementation and testing of IC’s and digital circuits. Class meets in the lab two hours per week and completes three team-based design projects. Students taking this course for graduate credit will complete an additional project and present the results to the class.

Evaluation Methods: A. Homework
                   B. Exams
                   C. Project

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* Refers to the number of educational objective(s) of the program leading to the BSEE degree at Arkansas Tech University that applies to course objective.
Performance Criteria:

Objective 1:
1.1 Students will demonstrate an understanding of the different types of custom IC’s. [A,B][d]
1.2 Students will be able to select the appropriate type of IC for an application based on economics. [A,B]

Objective 2:
2.1 Students will be proficient in the use of CAD for schematic capture, HDL design entry, simulation, synthesis, and implementation of custom IC’s. [A,C]

Objective 3:
3.1 Students will understand the usefulness of HDL and what types of activities it can automate. [A,C]
3.2 Students will be proficient in HDL programming. [A,B,C]

Objective 4:
4.1 Students will be able to work effectively in design teams. [C]
4.2 Students will be proficient in development of custom IC’s in the laboratory. [C]

Prepared by: Murray R. Clark, Assistant Professor
May, 2002

Revised by: Carl Greco, Ph.D., Associate Professor
August, 2005, August, 2006 and January 2007

d  Refers to evaluation method(s) to measure student performance.
ELEG 5153 Communications II

2006-07 Catalog Data: Prerequisites: ELEG 4143. Continuation of ELEG 4143. Design and analysis of analog and digital communication systems, taking into account the effects of noise. Random variables, random processes, analog and digital communication systems in the presence of noise. Optimum signal detection, channel capacity, error detecting and correcting codes. Lecture three hours.


Coordinator: Dr. Liu

Objectives:

1. Provide a review of probability and statistics as applied to communication systems. [1]*
2. Introduce random processes and methods for the mathematical description of noise in analog and binary communication systems. [1,3]
3. Introduce methods of binary data transmission. [1]
4. Introduce matched filter detection for binary data transmission in the presence of Gaussian white noise. [1]
5. To provide an introduction to binary signaling in a band limited channel and Nyquist’s pulse shaping criterion. [1]
6. To provide a brief introduction to information theory and source encoding. [1,3]
7. Provide experience in applying computer simulation to design and error rate prediction for communication systems. [1,3]
8. To provide some laboratory experience with the effects of noise. [1,2,3]

Topics:

8. Review of probability and statistics.
9. The concept of a random process: sample functions,

* Refers to the number of the educational objective(s) of the program leading to the BSEE degree at Arkansas Tech University that applies to course objective.
ensembles, power spectral density, the autocorrelation function, the Wiener-Khinchine theorem.
10. Effects of linear systems on random processes.
12. Pre and post detection signal to noise ratios for linear modulation systems.
13. Threshold effects in amplitude modulation systems.
14. Pre and post detection signal to noise ratios for angle modulation systems.
15. Threshold effects in angle modulation systems.
16. Pre-emphasis/de-emphasis filtering in angle modulated systems.
17. Binary data communication.
18. Binary data transmission in white Gaussian noise: the matched filter, optimum threshold, error probability.
19. Computation of error probabilities for some examples of coherent binary signaling: amplitude shift, phase shift, binary phase shift and frequency shift keying.
20. Effects of finite bandwidth on signaling, Nyquist's pulse shaping criterion for minimum inter-symbol interference.
21. Introduction to information theory: entropy, channel models, channel capacity.
22. Introduction to source encoding: source entropy, examples of source coding to remove redundancy.
23. Introduction to error detecting and correcting codes.

Computer Usage: Students will complete brief computer simulation projects requiring them to write Matlab code to simulate various aspects of communication systems in the presence of noise.
Students will use functions supplied to them to write Matlab code to design a simple binary data communication system and simulate its operation in the presence of noise.

Laboratory Projects: Selected examples of binary signaling techniques will be demonstrated on a portable instructional telecommunications modeling system.
Students will individually complete laboratory exercises involving the effects of noise and submit a laboratory report.

Evaluation Methods: D. Examinations and work sheets.
E. Computer simulation projects.
F. Grading of laboratory reports.

Performance Criteria: Objectives 1 through 6: Students will demonstrate understanding of the material presented in objectives by completing graded in-class examinations and work-sheets.

\[\text{[A]}^f\]

\[^f\text{Refers to evaluation method(s) to measure student performance.}\]
Objective 7: Students will demonstrate the ability to design simple communications links, and to carry out computer simulations of them, by writing code to simulate portions of analog and binary systems in the presence of noise.[B]
Objective 8: Students will submit graded laboratory reports.[C]

Additional Requirements for Graduate Students:

Graduate students taking this course are required to conduct an independent in-depth research project involving any one or more parts of a modern digital communication system. A proposal should be completed and consulted with the instructor within the first three weeks of the semester. A short presentation and an IEEE-style report are required in the last week before the Final Exam.
The project will be evaluated on the basis of theoretical results, simulation results, presentation, and report.

Prepared by:

Ping Liu, Assistant Professor
January, 2007
ENGR 5323 Power Plant Systems

Prerequisites: ENGR 3313, 4403 or consent. A study of the design and operation of steam-electric power plant components and systems. Fossil and renewable energy plants are emphasized. May not be taken for credit after completion of MCEG 4323.


References: Power Station Engineering and Economy; Skrotzki and Vopat, 1960, McGraw Hill (out of print) Thermodynamic and Transport Properties; Borgnakke and Sonntag, J. Wiley & Sons

Coordinator: Dr. John L. Krohn, Prof.

Prerequisites by Topic:
1. First and second laws of thermodynamics
2. Power cycle fundamentals
3. Basic fluid mechanics

Objectives:
1. To familiarize the student with the basic operation of the major components of a modern steam-electric power station. [B,C]
2. To develop a basic understanding of available energy resources. [A,E]
3. To familiarize the student with the basic methods of utilizing the energy resources identified in (2) above for producing electric power. [B]

Topics:
1. Thermodynamics review
2. Rankine cycle
3. Fossil-fueled steam generators
4. Turbine operation and design
5. Condensate-feedwater system
6. Circulating water systems - cooling towers
7. Thermal fission reactors and powerplants
8. Fast/breeder reactors and powerplants
9. Geothermal power - plant designs
10. Solar power - methods of utilization and design
11. Wind energy - wind turbines
12. Energy from the oceans - OTEC, waves, tidal power plants
13. Energy storage - storage systems and design
14. Environmental aspects of power generation

Laboratory and Computer Projects: Use of computerized property tables. Typically a field trip is taken to a nearby power plant. Students complete a
team project on a power plant design.

Graduate Credit: Graduate students will be required to complete a report on an assigned topic and present the results of their research on this topic to the class in the form of a class lecture.

Evaluation Methods:
1. Homework
2. Exams
3. Project report
4. Class lecture evaluation (graduate students only)

Performance Criteria:
Objective 1:
1.1 Students will demonstrate a basic understanding of the operation of: steam generator, steam turbine, condenser, feed water heaters, cooling towers.[1,2]
1.2 Students will demonstrate an understanding of design issues associated with each of the components listed in criteria 1.1.[2,3]
1.3 Students will demonstrate the ability to analyze steady-state operation of the above components and of a power cycle composed of these components.[1,2]

Objective 2:
2.1 Students will demonstrate a basic knowledge of each of the following energy resources: fossil fuels, nuclear power, solar, wind, geothermal, and energy from the oceans.[2]

Objective 3:
3.1 Students will demonstrate an understanding of the methods for recovering energy from each of the resources listed in 2.1.[1,2]

Prepared by: John L. Krohn, Prof.
Jan., 2007
ENGR 5503 Nuclear Power Plants I

2007-2008 Catalog Data:
Prerequisites: ENGR 3503, 4433. A study of the various types of nuclear power plants including the methods used for energy conversion. Relative advantages/disadvantages of various plant types investigated. May not be taken for credit after completion of MCEG 4503.

Textbook:
Nuclear Energy Conversion; M. M. El-Wakil, 1978, American Nuclear Society

References:
Power Station Engineering and Economy; Skrotsky and Vopat, 1960, McGraw Hill (out of print)
Thermodynamic and Transport Properties; Borgnakke and Sonntag, J. Wiley & Sons

Coordinator:
Dr. John L. Krohn, Prof.

Prerequisites by Topic:
1. First and second laws of thermodynamics
2. Power cycle fundamentals
3. Basic fluid mechanics
4. Basic nuclear engineering

Objectives:
1. To familiarize the student with the design and operation of the major nuclear reactor types. [B,C]
2. To develop a basic understanding of simple steady-state and transient control of criticality. [B,C]
3. To familiarize the student with the basics of economic analysis of electric power plants. [B]
4. To familiarize the student with selected alternative and conceptual reactor designs and fuel cycles. [A,B]

Topics:
1. Survey of nuclear power systems
2. Thermodynamics of nuclear power plants
3. The boiling water reactor (BWR)
4. BWR power plants
5. The pressurized water reactor (PWR)
6. PWR power plants
7. Gas cooled reactors (GCR)
8. GCR power plants
9. The fast breeder reactor (FBR)
10. FBR power plants
11. Other reactor types
12. Fusion power
13. Nuclear power economics
14. Environmental aspects of nuclear power
Laboratory and Computer Projects: Use of computerized property tables. Typically a field trip is taken to a nearby power plant. Students complete a team project on a power plant design.

Graduate Project: Graduate students will be required to complete a research paper on an assigned topic and present the results of their research to the class in an oral presentation.

Evaluation Methods: 1. Homework
2. Exams
3. Project report
4. Research report & presentation (graduate students only)

Performance Criteria: Objective 1:
1.1 Students will demonstrate an understanding of the operation of the major nuclear reactor types.[1,2]
1.2 Students will demonstrate an understanding of steam plants associated with nuclear reactors.[1,2,3]
Objective 2:
2.1 Students will be able to analyze simple steady-state and transient control of criticality.[1,2]
Objective 3:
3.1 Students will demonstrate an understanding of basic nuclear power economics. [1,2,3]
Objective 4:
4.1 Students will be able to describe nuclear fuel cycles – both currently in use and possible alternatives. [2]
4.2 Students will be able to describe selected alternative and conceptual nuclear reactor designs, including current designs. [2,3]
All Objectives: Students will complete a design project incorporating elements from all of the course objectives. [3]

Prepared by: John L. Krohn, Prof.
Jan., 2007
Prerequisites: MATH 5243 and MCEG 3503 or PHYS 3213. A study of the fundamental physical principles in the operation and design of nuclear reactors. Includes neutron-nucleus interactions, neutron energy spectra and energy dependent cross sections, neutron transport and diffusion theory, multi-group approximations, criticality calculations, and reactor analysis and design methods.


Coordinator: Dr. John Krohn

Objectives:
1. To introduce the fundamental physical principles governing operation of nuclear reactors.
2. To develop an understanding of the mathematical tools used to describe reactor principles and operations.
3. To familiarize the student with the structure and use of available nuclear data including cross section files.
4. To develop an understanding of the process of neutron moderation and modeling techniques for this process.
5. To introduce multi-group calculations and perturbation theory
6. To develop an understanding of the basics of reactor kinetics and dynamics.
8. To study the effects of core composition changes during operation
9. To introduce modern reactor analysis methods and codes and their use in the design of reactors.

Prerequisites by Topic:
1. Math through partial differential equations
2. Basic nuclear physics

Topic:
1. Fundamentals of nuclear systems
2. Mathematical description of physical phenomena: neutron transport, diffusion
3. Nuclear data and cross-section processing
4. Neutron moderation
5. Multi-group method
6. Perturbation theory
7. Reactor kinetics and dynamics
8. Core composition changes during reactor operation
9. Modern reactor analysis methods and codes
10. Nuclear reactor design principles
Laboratory and Computer Projects:

Computer based numerical solution techniques are required for several of the problems encountered in this course.

Evaluation Methods:

1. Homework
2. Exams
3. Class Participation
4. Project/programming assignments

Performance Criteria:

Objective 1
1.1 Students will be able to discuss qualitatively and quantitatively the fundamentals of nuclear systems. [1, 2, 3]

Objective 2
2.1 Students will be able to analyze nuclear reactor performance in terms of quantities describing neutron-nuclear interactions. [1, 2]

Objective 3
3.1 Students will be able to process nuclear data and prepare multi-group cross section libraries. [1, 2, 4]
3.2 Students will be able to discuss deterministic and stochastic approaches of nuclear reactor modeling. [1, 2, 4]

Objective 4
4.1 Students will be able to derive the neutron transport equation. [1, 2]
4.2 Students will be able to derive the neutron diffusion equation. [1, 2]

Objective 5
5.1 Students will be able to compute neutron distributions and multiplication factors in steady-state heterogeneous reactors using multi-group diffusion method. [1,2,4]

Objective 6
6.1 Students will be able to derive the first-order perturbation theory expression for reactivity change due to change in cross sections.[1, 2]

Objective 7
7.1 Students will be able to demonstrate analytical solutions of 1D, 2D and 3D time-dependent and time independent problems for bare homogeneous reactors. [1, 2]
7.2 Students will be able to develop one-group diffusion models for multi-region reactors. [1, 2, 4]
7.3 Students will be able to analytically and numerically solve simple neutron transport problems. [1, 2, 4]

Objective 8
8.1 Students will be able to compute effects due to core composition changes during reactor operation. [1, 2]

Objective 9
9.1 Students will develop a knowledge of modern reactor analysis codes. [2, 3]
Objective 10
10.1 Students will be able to develop models for nuclear reactor analysis and neutronics design. [1, 3, 4]
10.2 Students will be able to design heterogeneous reactors with specified characteristics. [1, 3, 4]

Prepared by:  
Dr. John L. Krohn, Prof.  
Jan. 2007
MCEG 6513 - Radiation Measurement

2008 - 2009 Catalog Data: MCEG 6513 - Radiation Measurement. Pre-requisites: MCEG 3512, MCEG 3523. The study of radiation techniques and equipment used by scientists and engineers. Topics of interest will include techniques and equipment for detecting ionizing radiation below about 20 MeV, Coincidence counting methods, and Reactor Laboratory experiments (as available). Lecture two hours, lab three hours.


Reference: EG&G Ortec, Experiments in Nuclear Science - AN34, EG&G Ortec, 1995

Coordinator: Dr. John Krohn

Objectives:
1. To learn radiation detection techniques and use equipment present in science and nuclear engineering laboratories. [2, 4]
2. The use of advanced counting and spectroscopy techniques and systems and their application. [4]
3. The use of reactors and their application to NAA. [4]
4. The preparation of formal lab reports. [1, 2, 3, 4]

Prerequisites by Topic:
1 - 2 Math and English skills with knowledge of electrical systems.
Radiation Sources - Units, definitions, and types of radiation.
Principles of operation of basic electronics, scintillation detectors, semiconductor detectors, GM counters.
3. Principles of proportional counters
4. Principles of solid state detectors
5 - 6. Principles of coincidence counting
7 - 11. Principles of reactor operation

Topics:
1. Review of Radiation Detection Electronics
2. Review of NaI(Tl), HPGe, and GM counters
3. Proportional counters
4. Solid State Detectors
5. Timed Coincidence Techniques and Absolute Activity Measurements
6. Gamma-Gamma Coincidence
7. Reactor Start-up
8. Neutron Activation – Thermal
9. Neutron Activation – Fast
10. Reactivity Worth of a Source / Regulating Rod, Void Coefficients
11. Axial Flux Profile

Computer Usage: The computer is utilized as a tool in data reduction and report preparation.

Laboratory Projects: Experiments are performed in lab.

Evaluation Methods:
A. Homework
B. Exams
C. Lab Reports

Performance Criteria:
Objective 1:
1.1 Students will demonstrate an ability to analyze spectra from radiation emitting sources. [A, B, C]

Objective 2:
2.1 Students will demonstrate an ability to use computer counting and analysis systems to analyze spectra from unknown radiation emitting sources. [C]
Objective 3:
3.1 Students will demonstrate an ability to use radiation based non-destructive testing methods to identify unknown samples. [C]

Objective 4:
4.1 Students will demonstrate an ability to communicate through the preparation of formal lab reports. [C]

Prepared by:       Name:   Dr. John L. Krohn        Date:   January 16, 2007
MCEG 6523 - Nuclear Materials

2007-2008 Catalog Data: Prerequisites: MCEG 2023 and MCEG 3503. A study of the properties of materials utilized in nuclear reactors, shielding systems and other systems exposed to radiation. Emphasis will be placed on understanding and mitigating the damage of such materials by neutron and gamma radiation. Lecture three hours.

Textbook: Nuclear Reactor Materials; Charles O. Smith, Addison-Wesley Publishing Co. (Prentice Hall)

Coordinator: Dr. Randy Culp, Professor

Prerequisites by Topic:
1. Material science fundamentals
2. Interaction of radiation with matter
3. Reactor fundamentals

Objectives:
1. To enable the student to understand the effects of radiation on materials used in the construction of nuclear systems.
2. To enable the student to select optimum materials for use in the design of nuclear systems.
3. To enable the student to understand the way of mitigating the radiation damage of materials.

Topics:
1. Reactor and isotopic power types
2. Requirements for reactor materials
3. Primary components and materials for fission reactors
4. Fundamentals of radiation effects on materials
5. Influence of radiation on material properties
6. Reactor fuels
7. Structural materials
8. Moderator, reflector, blanket and coolant materials
9. Control, shielding, and safety system materials
10. Nuclear fuel cycles, enrichment, and reprocessing
11. Radioisotopic power generators
12. Nuclear fusion reactor materials

Laboratory and Computer Projects: Students will use a computer-based program to solve the Boltzmann Transport Equations which mathematically model the fate of neutrons as they pass through various materials.

Evaluation Methods:
1. Exams
2. Graded homework problems
3. Project report

Performance Criteria:
Objective 1:
1.1 Be able to explain the types of radiation.
1.2 Be able to describe the typical materials used in nuclear
reactors and other nuclear systems such as isotopic power sources.

1.3 Be able to explain the mechanisms by which the energy associated with radiation is deported within materials during collisions.

1.4 Be able to explain how material structure and properties are altered as a result of radiation exposure.

Objective 2:

2.1 Be able to select appropriate materials for specific application in nuclear systems.

Objective 3:

3.1 Be able to describe ways of preventing or minimizing exposure of nuclear systems to radiation.

3.2 Be able to explain ways of restoring integrity to materials which have been damaged by radiation.

Prepared by:

Dr. Randy Culp
January, 2007
MCEG 6533 Radiation Interactions & Shielding

2007-2008 Catalog Data: Prerequisites: MCEG 3503 and MCEG 3523. Basic principles of radiation interactions, transport and shielding. Radiation sources, nuclear reactions, radiation transport, photon interactions, dosimetry, and shielding design will be covered.

Textbook: Radiation Shielding; J. Shultis and R. Faw, ANS, 2000

References: Radiation Shielding and Dosimetry; A.E. Profio, J. Wiley & Sons, 1979. (0-471-04329-X)

Coordinator: Dr. John Krohn

Objectives: 1. To develop an understanding of the basic principles of radiation interactions with various materials. 2. To develop an understanding of the transport of radiation through common materials. 3. To develop an understanding of the structure and use of available radiation attenuation (cross sections) data. 4. To develop an understanding of the common devices and methods used in radiation dosimetry. 5. To develop a basic understanding of mathematical tools used to predict shielding effects of various materials. 6. To introduce methods of radiation shielding design.

Prerequisites by Topic: 1. Math through differential equations 2. Basic nuclear physics


Laboratory and Computer Projects: Computer based numerical solution techniques are required for several of the problems encountered in this course.
Evaluation Methods:
1. Homework
2. Exams
3. Class Participation
4. Project/programming assignments

Performance Criteria:
Objective 1
1.2 Students will be able to discuss qualitatively and quantitatively the interaction of various radiations with matter. [1, 2, 3]

Objective 2
2.1 Students will be able to analyze radiation transport processes using exact and approximate methods. [1, 2, 4]

Objective 3
3.1 Students will be able to process nuclear data and prepare multi-group cross section libraries. [1, 2, 4]

Objective 4
4.1 Students will be able to describe common radiation dosimetry methods and devices. [1, 2]
4.2 Students will demonstrate knowledge of basic radiation protection standards. [1, 2]

Objective 5
5.1 Students will be able to compute radiation transport and absorbed dose through single- and multiple-layer shielding. [1, 2, 4]

Objective 6
6.1 Students will be able to design basic radiation shielding. [1, 2]
6.2 Students will be able to assess shielding design through predictive calculations. [1, 2, 4]

Prepared by:
Dr. John L. Krohn, Prof.
Jan. 2007
Agenda Item No. 25
Higher Education Coordinating Board
April 27, 2007

MASTER OF ENGINEERING
ARKANSAS TECH UNIVERSITY

The administration and Board of Trustees of Arkansas Tech University (ATU) request approval to offer the Master of Engineering degree. ATU is accredited by the Higher Learning Commission of the North Central Association of Colleges and Schools. The proposed degree is within the role and scope of the institution. The ATU Board of Trustees approved the proposal on January 30, 2007.

Description of Program

The proposed 36-semester credit hour master’s program builds upon existing undergraduate degrees in mechanical engineering, engineering physics, and nuclear technology. It is designed to enhance the professional competencies of engineers engaged in project management and team leadership. The curriculum includes coursework in business management, communications, physics, and mathematics. Four new courses in nuclear engineering (12 credit hours) will be added to the curriculum. Five existing courses will be expanded to meet advanced study requirements. Students may complete a technical project course with Arkansas Nuclear One or another engineering-related company. Program graduates will be prepared to fill senior-level engineering and project management positions.

To be admitted to the program, students must hold a bachelor’s degree in engineering from an Accreditation Board for Engineering and Technology (ABET) accredited program and submit an appropriate GRE score. A maximum of 9 credit hours of graduate engineering coursework may be accepted for transfer toward completion of the degree requirements.

Need for the Program

Implementation of the proposed master’s program will allow ATU to expand graduate program offerings to engineers in central Arkansas. There is not an engineering program with a nuclear focus offered in Arkansas.

Area engineering firms have indicated a need for more professionals with management and technical and non-technical communication skills to serve as project managers. There also is a need for engineers to fill positions in the nuclear industry. Entergy recently obtained a permit to build another nuclear power unit at its Grand Gulf facility in Mississippi, and 15 national companies are considering building commercial nuclear power reactors.
Recent ATU graduates and engineers employed at Arkansas Nuclear One have expressed an interest in the proposed program. Ten students are expected to enroll in the program initially.

Program Costs

Additional computer equipment and software, radiation measurement equipment, library resources, two graduate assistants, and two full-time faculty members will be required for the program. Annual funds for the program ($92,700 in Year 1 increasing to $189,750 in Year 2) will come from new student tuition and fees, state general revenues, private donations, and the redistribution of the existing budget for salaries, library, and computer acquisitions and maintenance. There will be no additional administrative costs.

Program Duplication

The master's in engineering is offered at the University of Arkansas, Fayetteville, but this program does not have an emphasis in nuclear engineering. Similar engineering management degrees are offered at the University of Missouri—Rolla, North Carolina State University, Cornell University, and Michigan Technological University.

Desegregation

African American graduate student enrollment is 2 percent. Other minority graduate enrollment is 20 percent.

Program Productivity

In 2005-06, 11 of 17 (65 percent) master's degree programs at ATU met Coordinating Board degree productivity guidelines.

The following resolution is presented for Coordinating Board consideration.

**RESOLVED**, That the Arkansas Higher Education Coordinating Board approves the Master of Engineering (CIP 14.0101) at Arkansas Tech University, effective Fall 2007.

**FURTHER RESOLVED**, That the Coordinating Board instructs the Director of the Arkansas Department of Higher Education to inform the President and Chair of the Board of Trustees of Arkansas Tech University of the approval.